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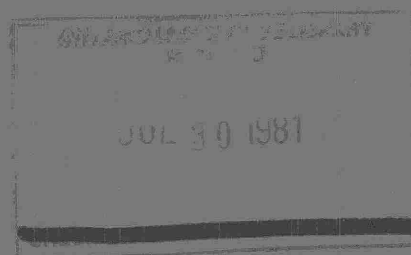
REPORT ON AMBIENT AIR SURVEYS IN THE SARNIA AREA

APRIL, MAY AND JUNE, 1977

OCTOBER AND NOVEMBER, 1978

ARB-TDA Report No. 03-81

PUBLISHED MARCH, 1981



Ontario

Ministry
of the
Environment

The Honourable
Harry C. Parrott, D.D.S.,
Minister

Graham W. S. Scott, Q.C.,
Deputy Minister

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Air Resources Branch
Technology Development and Appraisal Section
Monitoring and Instrumentation Development Unit

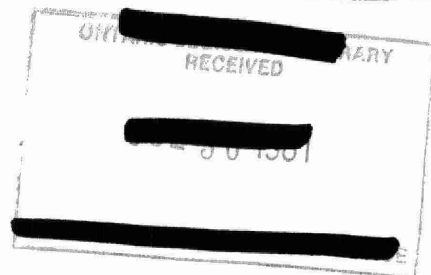
ARB-TDA Report No. 03-81

REPORT ON AMBIENT AIR SURVEYS
IN THE
SARNIA AREA

April, May and June, 1977

October and November, 1978

February, 1981



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01. SUMMARY

Ambient air quality surveys were carried out by the Monitoring and Instrumentation Development Unit of the Air Resources Branch in the Sarnia area during April, May, and June, 1977 and October and November, 1978. The purpose was to monitor sulphur dioxide (SO_2), hydrogen sulphide (H_2S), vinyl chloride monomer and ethylene during the 1977 survey and SO_2 , H_2S , benzene and some benzene derivatives (aromatics) during the 1978 survey.

The high density of potential sources for several of the contaminants made it difficult, if not impossible, to ascertain the contributions from each of the suspected sources. For that reason the results were often compared to the Air Quality Criteria and discussed in terms of areas, rather than Standards or Guidelines in relation to particular sources.

The downtown Sarnia area had generally low concentrations of SO_2 and H_2S during each survey period. Monitoring in the Vidal street area showed that from 1977 to 1978 a large reduction occurred in the number of excursions above the 1-hour Criteria for SO_2 and H_2S . There was also a large reduction in the maximum concentration obtained for each contaminant. Ambient air quality in the Corunna area also showed noticeable improvement during the 1978 survey period compared to the 1977 period. The Courtright and Petrolia areas were investigated during the 1977 period and concentrations were generally low except for H_2S in Petrolia, where the Criterion was exceeded for 2 of the 3 monitoring periods.

The concentration of vinyl chloride monomer (VCM) in the Vidal street area was usually below the detection limit (0.005 ppm), but 2 air samples gathered downwind of the Esso Chemical polyvinyl chloride (PVC) plant exceeded the Ontario 30-minute Guideline (0.2 ppm). Maintenance error at the PVC plant was the most probable reason for the excessive VCM. Most of the few samples taken during calm, poor dispersion conditions in the Vidal street area showed VCM present. No VCM was found in

the vicinity of the Imperial Oil main refinery complex on the west side of Vidal street. VCM was found in only 1 of the 21 samples taken in the vicinity of the Dow Chemical VCM plant.

The Tentative Design Standard for ethylene (0.14 ppm - ½ hour) was frequently exceeded in many areas of Sarnia during the 1977 survey period, but was not monitored during 1978.

The benzene Standard of 3 ppm was not exceeded during the 1978 survey period. Of the hydrocarbons with established Standards only styrene was found to have exceeded the Standard during the 1978 survey; the Standard was exceeded for 10 of the 81 samples, including once by a factor of 8.

02. INTRODUCTION

As requested by the Southwestern Region, the Monitoring and Instrumentation Development Unit of the Air Resources Branch conducted an ambient air quality survey in the vicinity of Sarnia, Corunna, Courtwright and Petrolia during April, May and June, 1977. Sulphur dioxide (SO_2), hydrogen sulphide (H_2S), ethylene and vinyl chloride were the gaseous pollutants of primary interest during this survey.

During October of 1978 another ambient air quality survey was conducted in the Sarnia and Corunna areas by the same Unit of the Air Resources Branch. The gaseous pollutants of primary interest during this period were sulphur dioxide, hydrogen sulphide and certain hydrocarbons such as paraffins, benzene and some of the benzene derivatives.

Two Mobile Air Monitoring (MAM) units (i.e. Transmode and Ford) were employed during 1977 and one unit (Transmode) was used during 1978. The monitoring programmes carried out by the Transmode included measurements of other gaseous pollutants and a variety of ground-based meteorological parameters.

Due to the relative proximity of several potential air pollution sources in the Sarnia industrial complex, specific source identification was found to be a major problem during the surveys. The observers could only identify the "most probable source" for each monitoring period; therefore, the results for SO_2 , H_2S , nitrogen dioxide (NO_2) and ozone (O_3) have been compared to the Ambient Air Quality Criteria for a 1-hour time interval. The vinyl chloride and hydrocarbon results were based on 30-minute integrated samples which were analyzed by a gas chromatograph. The source of these compounds could often be ascertained with more confidence, so the results were compared to the appropriate Ontario Standard, Guideline or Tentative Design Standard for a 30-minute period.

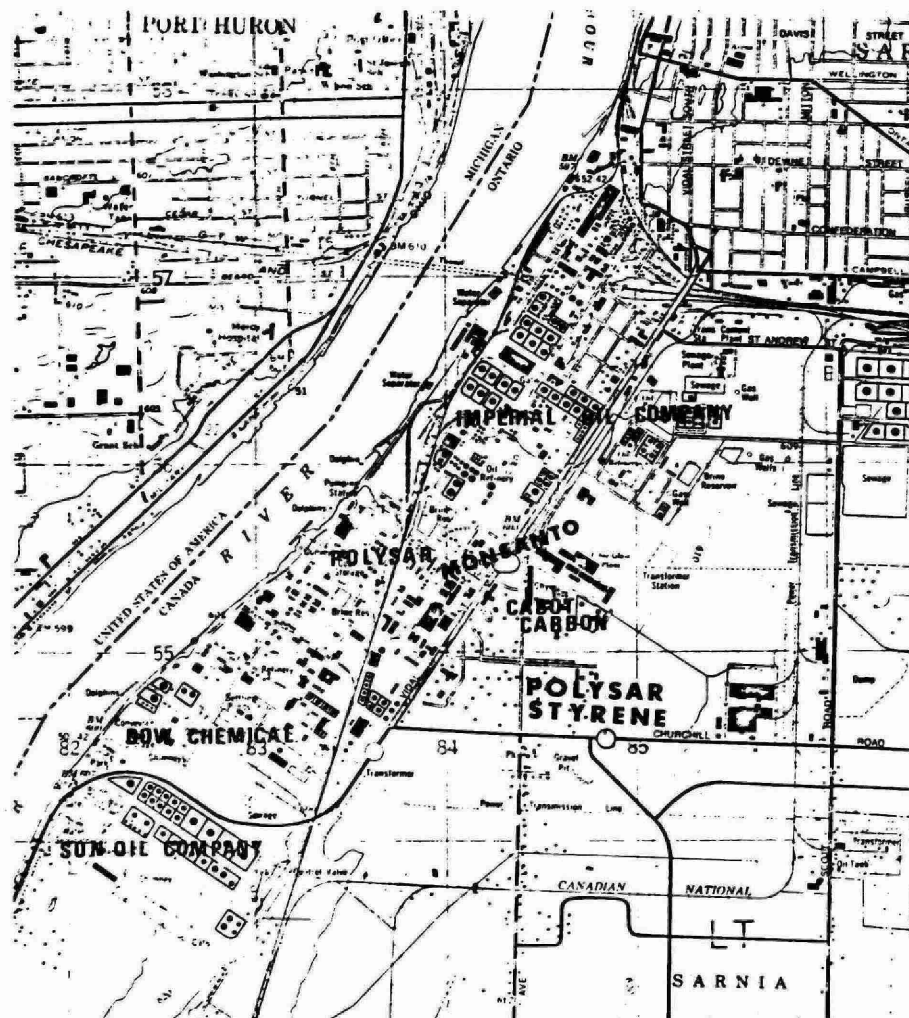
03. DESCRIPTION OF SOURCES

The main purpose of the surveys was to monitor the ambient air quality in the vicinity of a large industrial complex located immediately to the south of the city of Sarnia. This complex (approximately 30 km² in area) contains Imperial Oil, Dow Chemical, Polysar, Fiberglas, Monsanto, Cabot Carbon and Sun Oil Companies and is situated along the east bank of the St. Clair River (Refer to MAP #1).

These surveys also measured ambient air quality in the vicinity of the Shell Oil Company refinery, the Ethyl Corporation plant and the Dupont Company plant located 2 km north of the community of Corunna (MAP #2) near the east bank of the St. Clair River.

The 1977 survey also monitored concentrations of gaseous pollutants in the vicinity of the Ontario Hydro Lambton Generating Station located on the east shore of the St. Clair River, 2 km south of the community of Courtright (MAP #3); in addition, gaseous pollutants in the vicinity of the oil wells located near the Town of Petrolia were monitored (MAP #4).

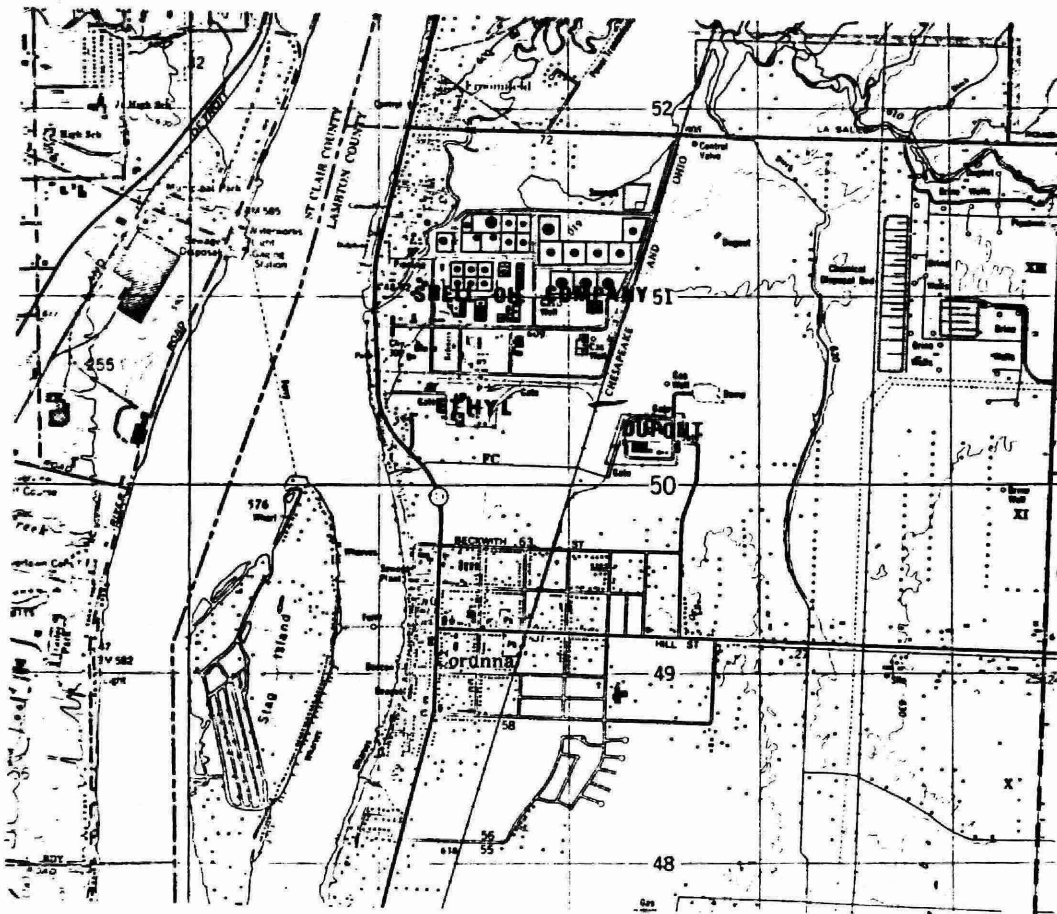
Many samples were gathered in the vicinity of the Esso Chemical polyvinyl chloride (PVC) plant and the Dow Chemical vinyl chloride (VCM) plant during the 1977 survey for detection and analysis by a gas chromatograph. These plants are shown on MAP #9 in the Appendix.



SUSPECTED SOURCES
SARNIA SURVEYS

0 1 km

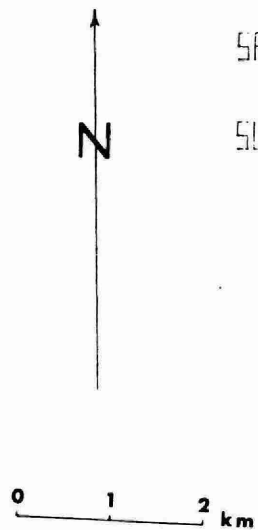
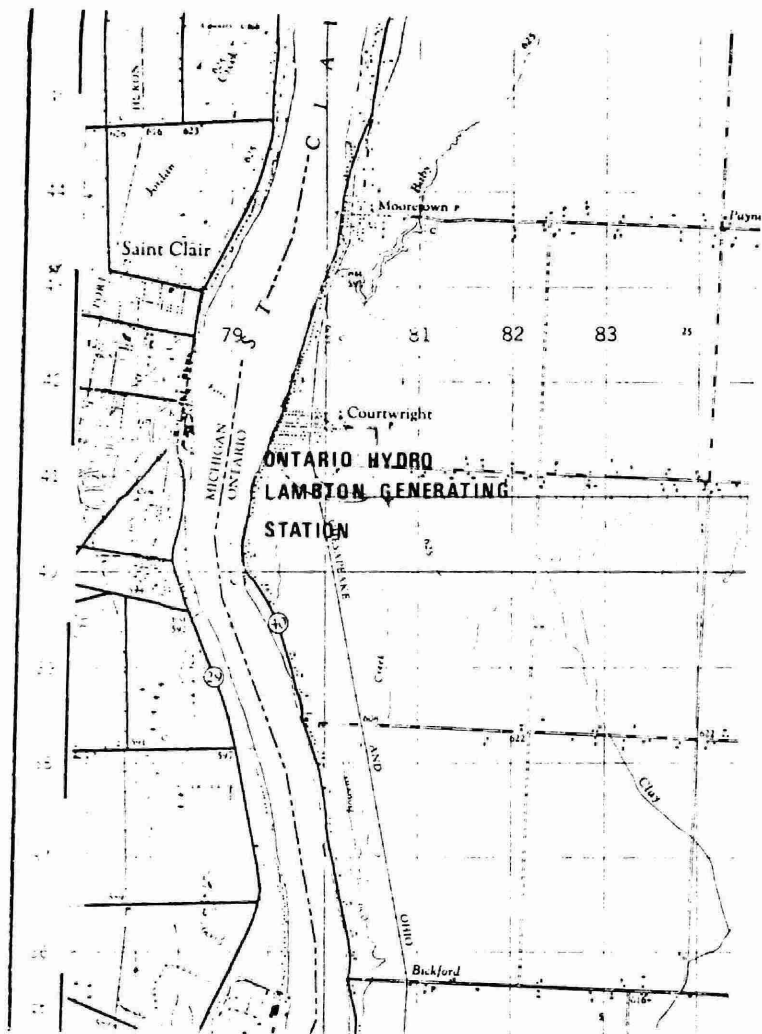
MAP #1



↑ SUSPECTED SOURCES
 N SARNIA SURVEYS

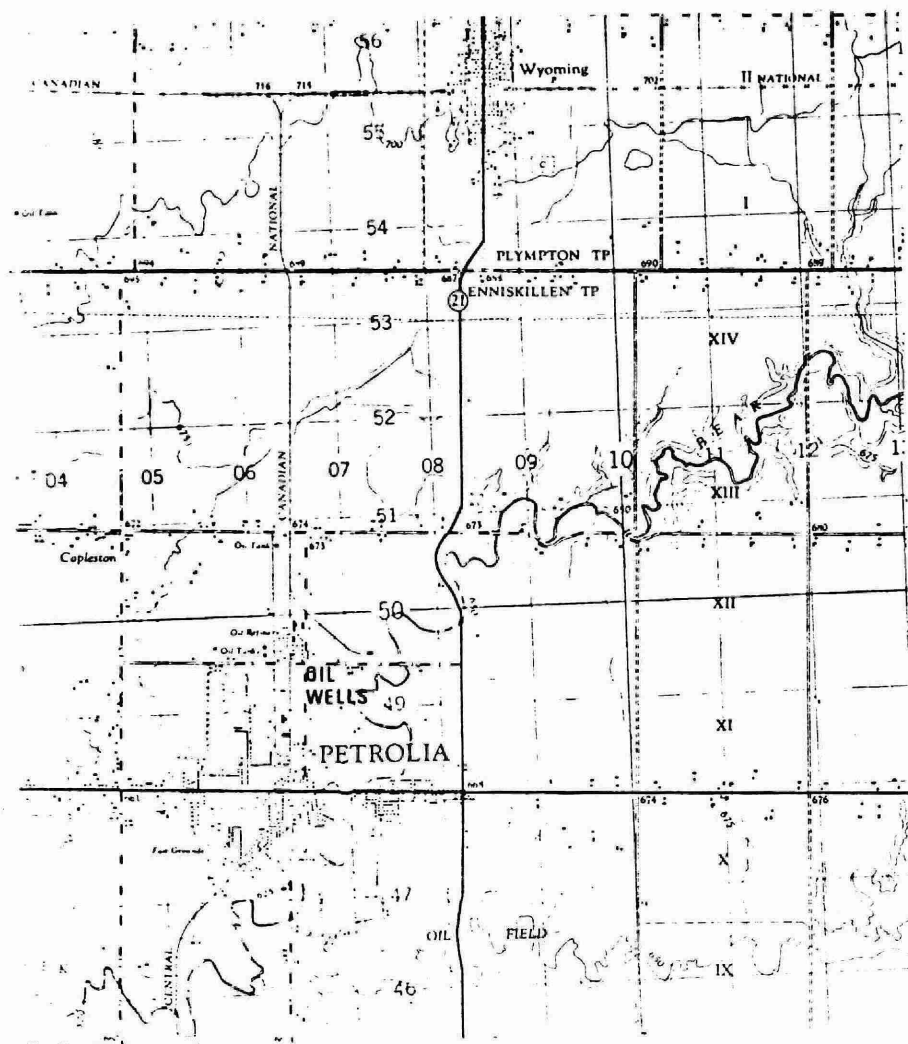
0 1 km

MAP #2



SARNIA 1977 SURVEY
SUSPECTED SOURCES

MAP #3



SARNIA 1977 SURVEY
SUSPECTED SOURCES

MAP # 4

04. MONITORING TECHNIQUE

Sample Collection -

The ambient air samples were taken at a constant flow rate (approximately 0.2 cubic metres/min) by probes located on the vans from a point approximately 5 m above ground level. Air samples entered a manifold where each analyzer was parallel tapped with a minimal length of teflon sampling line. This arrangement ensured little or no sample degradation, minimal delay time and minimal sample contamination due to ground level sources (e.g., entrained soil, vehicular traffic, etc.).

Samples to be analyzed by the gas chromatograph were collected over a period of 30 minutes in multiple layer aluminized polyester bags with the use of battery operated personal pumps.

Instrumentation -

The instruments associated with each monitoring unit are presented in Tables 1 and 2.

Meteorological Analyses -

Meteorological conditions were monitored on a continuous basis by the instrumentation associated with the GMC Mobile Air Monitoring (MAM) unit (reference Table 2). No meteorological data were collected by the Ford MAM unit. Since the survey status was a microscale phenomenon, and since both units were in close proximity, the GMC data were found to be more than sufficient. Complementing this microscale monitoring, macroscale information regarding air mass movements and prognostics was obtained from Environment Canada.

TABLE 1: INSTRUMENTATION - FORD MAM UNIT

<u>Instrument</u>	<u>Manufacturer</u>	<u>Analytical Technique</u>	<u>Maximum Sensitivity (Full Scale)</u>
H ₂ S Source	Hartmann & Braun (H&BPrufgasgenerator)	N/A	N/A
*H ₂ S Analyzer	H&B Picos	electrochemical	0.05 ppm
SO ₂ Source	H&B Prufgasgenerator	N/A	N/A
SO ₂ Analyzer	Wosthoff oHG Ultragas-3	conductivity	1 ppm
O ₃ Analyzer/Source	Dasibi 1003 - PC	Ultra-violet Absorption	1 ppm
NO _x , NO ₂ , NO Analyzer	Bendix 8101-B	chemiluminescent	0.5 ppm
NO _x Source	H & B Prufgasgenerator	N/A	N/A
CO Analyzer	H&B Uras 2T	Infrared Absorption	50 ppm
THC, CH ₄ , THC-CH ₄ Analyzer	Ingenieur - Produktions-Gruppe Munchen (IPM) RS-5	Dual flame 50 ppm THC (as CH ₄) ionization detector	
CO, THC, THC-CH ₄ , CH ₄ source	Matheson	compressed gas	N/A

* This instrument was also sensitive to the mercaptan and other HS⁻ groups, but the results will be reported as ppm H₂S.

TABLE 2: INSTRUMENTATION - MAM

<u>Instrument</u>	<u>Manufacturer</u>	<u>Analytical Technique</u>	<u>Maximum Sensitivity (Full Scale)</u>
H ₂ S Source	Hartmann & Braun (H&BPrufgasgenerator)	N/A	N/A
*H ₂ S Analyzer	H&B Picos	electrochemical	0.05 ppm
SO ₂ Source	H&B Prufgasgenerator	N/A	N/A
SO ₂ Analyzer	H&B Picoflux 2	conductometric	0.3 ppm
O ₃ Analyzer/Source	Bendix 8002	chemiluminescent	0.05 ppm
NO _x , NO ₂ , NO	Bendix 8101-B	chemiluminescent	0.5 ppm Analyzer
NO _x Source	H&B Prufgasgenerator	N/A	N/A
CO Analyzer	H&B Uras 2T	Infrared Absorption	50 ppm
THC, CH ₄ , THC-CH ₄ Analyzer	Ingenieur - Produktions-Gruppe Munchen (IPM) RS-5	Dual flame ionization detector	50 ppm THC
Hg Analyzer	Scintrex HGP-2	Ultra-violet Absorption	200 ng/m ³
CO, THC, THC-CH ₄ , CH ₄ source	Matheson	compressed gas	N/A

* This instrument was also sensitive to the mercaptan and other HS⁻ groups, but the greatest percentage is expected to be H₂S and the results will be reported as ppm H₂S.

<u>Instrument</u>	<u>Manufacturer</u>	<u>Scale</u>
**Wind speed	Lambrecht gmbH	km/hr
**Wind Direction	Lambrecht gmbH	degrees
Temperature	Weather Measure (WM) T621	°C
Relative humidity	WM-HM-11P	percent
Barometric pressure	WM-BM70-B242	millibars
Solar radiation	WM Star Pyranometer	watts/cm ²

** These wind indicators are located on top of a 10-metre retractable mast.

05. SURVEY TECHNIQUE

Two mobile air monitoring units, a 1971 Ford Econoline SP-200 van and a 1975 General Motors Corporation Transmode, were utilized to monitor the ambient air quality in the areas as described in Section 03. Both units were equipped with automated data acquisition systems (Ford - Hewlett & Packard 3480 system and the GMC - Hewlett & Packard 9830A mini-computer system) and on-board electric generators (Ford - 3.5 kW and GMC - twin 6 kW). Automated, independent and continuous monitoring capabilities were a major feature of these units. The HP 9830A mini-computer system performed initial data analyses in the field (re: accuracy and validity) but the final data reduction and analyses were carried out by a larger system located within the Air Resources Branch at 880 Bay Street, Toronto.

Each unit had permanently installed analyzers for monitoring of sulphur dioxide, carbon monoxide, hydrogen sulphide, total hydrocarbons, methane, and oxides of nitrogen.

In addition, ambient air concentrations of vinyl chloride, ethylene and other hydrocarbons were detected and analyzed by a Hewlett & Packard gas chromatograph that was incorporated with the Transmode MAM unit.

Following an assessment of wind-direction and wind-speed, the approximate location of maximum ground level concentration (GLC) impingement zones were found and ambient air monitoring was initiated within these areas. Air quality was continuously monitored for at least one hour at each location, and whenever possible, farther downwind monitoring was undertaken.

06. RESULTS

Definition of Terms:

Scan Time:	Time interval for averaging and data logging of instantaneous interrogations by the Data Acquisition System.
Time:	Time of first and final scans used to determine running averages.
Number of Readings:	Number of scans.
MAM:	Mobile Air Monitoring
MAC:	Maximum average concentration during each monitoring period.

The concentrations in TABLES 3 to 32 are based on cumulative 1-hour arithmetic means of instantaneous interrogations of the analytical instruments and are expressed in parts per million (ppm).

The hydrocarbon concentrations from the gas chromatograph analyses are listed in TABLES 33 to 52 and expressed as parts per billion (ppb) by volume. The results are based on integrated air samples collected continuously over 30-minute periods. TABLE 53 shows the 1978 survey arithmetic means of each of the compounds according to the monitoring area. Existing Ontario ½-hour Standards or Provisional guidelines are noted in TABLE 53 as well.

Of the hydrocarbons monitored in the 1977 survey, vinyl chloride has an Ontario ½-hour Guideline of 0.2 ppm, whereas ethylene has a Tentative Design Standard of 0.14 ppm.

Concentration-time plots display the running 1-hour average concentrations of the continuously monitored contaminants such as SO_2 , H_2S , NO_2 , O_3 , total hydrocarbons (THC) and methane (CH_4), and several meteorological parameters also. The plots for the more interesting monitoring periods are found in the Appendix.

The following ambient air quality Criteria, based on a 1-hour average concentration, are pertinent to the results presented in this report.

Contaminant	Criterion
SO_2	0.25 ppm
$\text{H}_2\text{S}(\text{TRS})$	0.02 ppm
NO_2	0.20 ppm
O_3	0.08 ppm

As noted in TABLES 1 and 2 the H_2S analyzer is also sensitive to mercaptans and the HS^- group, so that the analyzer is actually a total reduced sulphur (TRS) analyzer. Although the Criterion for mercaptans is 0.01 ppm methyl mercaptan (1-hour average), the TRS analyzer response is compared to the less restrictive Criterion for H_2S .

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TABLE # 3AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF _____

MONITORING LOCATION / NUMBER	DATE '77	MONITORING TIME START / END	INSTANTANEOUS CONCENTRATION				MAXIMUM 60-MINUTE AVERAGE CONCENTRATION		MONITORING PERIOD AVERAGE CONCENTRATION		SCAN TIME Min.
			SO ₂		TRS		SO ₂	TRS	SO ₂	TRS	
			Min.	Max.	Min.	Max.					
Sarnia #1	APRIL 22	11:06 -12:56		0.009		0.024	0.003	0.007	0.002	0.007	1.0
" #3	26	10:23 -13:08		0.059		0.025	0.039	0.020	0.028	0.016	1.0
" #4	26	14:26 -18:56		0.072		0.021	0.015	0.001	0.011	0.001	1.0
" #7	27	12:14 -17:59		0.117		0.020	0.074	0.011	0.056	0.003	1.0
" #8	MAY 5	17:26 -19:26		0.025		0.017	0.009	0.008	0.009	0.007	1.0
" #9	5	19:41 -22:26		0.031		0.007	0.015	0.006	0.012	0.005	1.0
" #10	5	23:41 -08:56		0.037		0.138	0.012	0.005	0.009	0.003	1.0
" #12	6	10:20 -11:50		0.105		0.012	0.019	0.005	0.018	0.005	1.0
" #13	9	14:16 -15:26		0.124		0.009	0.057	0.001	0.055	0.001	1.0
" #14	9	15:44 -17:34		0.249		0.051	0.072	0.021	0.066	0.014	1.0
" #15	9	17:47 -19:27		0.334		0.074	0.13	0.043	0.122	0.040	1.0
" #17	9	20:43 -09:13		0.024		0.018	0.014	0.002	0.009	0.001	1.0
" #18	10	13:54 -17:24		0.637		0.032	0.20	0.010	0.176	0.008	1.0
COMMENTS;											

TABLE # 4AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF _____

MONITORING LOCATION / NUMBER	DATE '77	MONITORING TIME START / END	INSTANTANEOUS CONCENTRATION				MAXIMUM 60-MINUTE AVERAGE CONCENTRATION		MONITORING PERIOD AVERAGE CONCENTRATION		SCAN TIME Min.
			SO ₂		TRS		SO ₂	TRS	SO ₂	TRS	
Sarnia #20	MAY 10	18:33-22:33		0.205		0.008	0.057	0.001	0.028	0.001	1.0
" #21	10	22:49-09:34		0.041			0.033		0.023		1.0
" #22	11	10:43-16:13		1.09		0.080	0.19	0.014	0.117	0.010	1.0
" #23	11	17:46-00:01		0.675		0.007	0.069	0.001	0.021	0.001	1.0
" #24	12	00:00-08:30		0.030		0.010	0.010	0.007	0.006	0.006	1.0
" #27	12	14:47-16:37		0.150		0.016	0.046	0.004	0.033	0.003	1.0
" #28	12	17:19-23:19		0.064		0.006	0.013	0.001	0.003	0.001	1.0
" #29	12	23:32-09:02		0.081		0.026	0.029	0.022	0.018	0.021	1.0
" #31	16	20:40-08:25		2.57		0.056	0.46	0.041	0.232	0.035	1.0
" #33	17	12:10-14:40		0.088		0.002	0.009	0.001	0.008	0.001	1.0
" #35	17	17:29-22:59		0.247		0.026	0.066	0.014	0.034	0.010	1.0
" #36	17	23:06-09:06		0.296		0.024	0.140	0.010	0.069	0.003	1.0
" #37	18	10:30-12:20		0.180		0.017	0.071	0.009	0.047	0.008	1.0
COMMENTS;											

TABLE # 5AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF _____

MONITORING LOCATION / NUMBER	DATE '77	MONITORING TIME START / END	INSTANTANEOUS CONCENTRATION				MAXIMUM 60-MINUTE AVERAGE CONCENTRATION		MONITORING PERIOD AVERAGE CONCENTRATION		SCAN TIME
			SO ₂		TRS		SO ₂	TRS	SO ₂	TRS	
Sarnia #41	MAY 18	17:10-06:40		0.414		0.034	0.084	0.011	0.015	0.008	1.0
" #42	19	06:57-08:37		0.535		0.018	0.047	0.011	0.044	0.010	1.0
" #43	19	10:01-12:16		0.103		0.019	0.047	0.003	0.021	0.003	1.0
" #46	19	18:32-07:02		0.052		0.001	0.031	0.001	0.018	0.001	1.0
" #47	20	09:57-11:57		0.293		0.012	0.16	0.006	0.110	0.005	1.0
" #48	24	19:14-06:44		0.020		0.033	0.010	0.002	0.007	0.001	1.0
" #49	25	09:14-19:59		2.48		0.482	1.2	0.170	0.481	0.042	1.0
" #50	25	21:28-07:28		1.32		0.040	0.420	0.006	0.126	0.002	1.0
" #52	26	11:16-15:16		3.16		0.436	0.950	0.160	0.365	0.084	1.0
" #53	26	17:31-08:31		0.134		0.007	0.049	0.003	0.011	0.001	1.0
" #54	27	09:04-12:34		0.386		0.009	0.18	0.003	0.084	0.001	1.0
" #55	30	13:50-14:56		0.356		0.044	0.091	0.018	0.083	0.017	1.0
" #56	30	15:29-07:14		3.75		0.03	0.640	0.020	0.189	0.011	1.0
COMMENTS;											

Units - PPM

[illegible]

TABLE # 7AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF _____

MONITORING LOCATION / NUMBER	DATE '77	MONITORING TIME START / END	INSTANTANEOUS CONCENTRATION				MAXIMUM 60-MINUTE AVERAGE CONCENTRATION		MONITORING PERIOD AVERAGE CONCENTRATION		SCAN TIME Min.
			SO ₂		TRS		SO ₂	TRS	SO ₂	TRS	
Sarnia #101	APRIL 22	11:15-12:55		0.022		-	0.016	-	0.015	-	1.0
" #104	26	10:30-1500		0.013		-	0.008	-	0.008	-	5.0
" #105	26	15:05-19:05		0.020		-	0.015	-	0.011	-	1.0
" #107	27	10:37-13:22		0.331		0.334	0.10	0.083	0.096	0.066	1.0
" #108	27	14:00-18:00		0.417		0.512	0.17	0.15	0.161	0.142	1.0
" #109	MAY 4	10:45-11:50		0.003		0.053	0.001	0.031	0.001	0.031	1.0
" #110	4	12:25-14:15		0.001		0.015	0.001	0.192	0.001	0.011	1.0
" #112	4	16:40-17:50		0.182		0.012	0.062	0.008	0.056	0.008	1.0
" #113	5	12:58-14:58		0.477		0.211	0.21	0.094	0.157	0.080	1.0
" #114	5	15:40-16:45		0.256		0.119	0.14	0.06	0.139	0.059	1.0
" #115	5	20:45-08:45		0.283		0.001	0.16	0.001	0.001	0.001	3.0
" #117	6	10:03-12:03		0.393		0.021	0.13	0.006	0.118	0.004	1.0
" #118	11	10:38-01:53		0.287			0.039		0.015		3.0
COMMENTS;											

TABLE # 8AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF _____

MONITORING LOCATION / NUMBER	DATE	MONITORING TIME START / END	INSTANTANEOUS CONCENTRATION				MAXIMUM 60-MINUTE AVERAGE CONCENTRATION		MONITORING PERIOD AVERAGE CONCENTRATION		SCAN TIME
			SO ₂		TRS		SO ₂	TRS	SO ₂	TRS	Min.
			Min.	Max.	Min.	Max.					
Sarnia #120	MAY 12	14:32-15:43		0.281		-	0.11	-	0.094	-	1.0
" #122	12	17:17-08:47		1.71		-	0.960	-	0.180	-	3.0
" #123	13	10:05-11:10		0.075		-	0.028	-	0.028	-	1.0
" #124	16	20:36-08:36		0.003		0.016	0.002	0.003	0.002	0.001	3.0
" #125	17	11:35-12:43		0.339		0.008	0.14	0.006	0.129	0.005	1.0
" #128	18	11:20-12:30		0.001		0.036	0.001	0.021	0.001	0.021	1.0
" #129	18	13:55-15:01		0.001		0.024	0.001	0.007	0.001	0.007	1.0
" #130	18	17:45-08:15		0.002		0.030	0.001	0.004	0.001	0.001	3.0
" #131	19	11:18-15:03		0.001		0.229	0.001	0.071	0.001	0.047	1.0
" #133	20	10:23-11:23		0.007		-	0.005		0.005		1.0
" #135	24	18:14-06:44		0.002		0.267	0.001	0.012	0.001	0.012	3.0
" #136	25	09:24-10:24		0.021		0.350	0.007	0.084	0.006	0.074	1.0
" #137	25	12:19-14:19		0.004		0.001	0.002	0.001	0.002	0.001	1.0
COMMENTS;											

TABLE # 9AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF _____

MONITORING LOCATION / NUMBER	DATE '77	MONITORING TIME START / END	INSTANTANEOUS CONCENTRATION				MAXIMUM 60-MINUTE AVERAGE CONCENTRATION		MONITORING PERIOD AVERAGE CONCENTRATION		SCAN TIME Min.
			SO ₂		TRS		SO ₂	TRS	SO ₂	TRS	
Sarnia #138	MAY 25	18:20-20:50		0.018		0.030	0.011	0.014	0.009	0.009	1.0
" #139	25	21:10-05:40		0.005		0.045	0.001	0.037	0.001	0.017	5.0
" #141	26	11:47-15:02		0.013		0.039	0.001	0.010	0.001	0.004	1.0
" #142	26	17:00-19:30		0.262		0.031	0.18	0.018	0.144	0.017	1.0
" #143	26	20:40-08:55		0.151		0.046	0.12	0.033	0.058	0.019	5.0
" #145	30	16:45-19:30		0.019		0.051	0.019	0.020	0.010	0.009	1.0
" #146	31	11:20-13:35		1.66		0.132	0.310	0.046	0.228	0.045	1.0
" #147	31	21:11-06:26		0.012		0.012	0.009	0.003	0.002	0.001	5.0
" #150	JUNE 1	13:10-14:30		0.022		0.004	0.01	0.002	0.009	0.001	1.0
" #152	1	17:05-18:10		0.005		0.003	0.002	0.001	0.002	0.001	1.0
" #153	1	19:23-01:53		0.002		0.001	0.002	0.001	0.002	0.001	3.0
" #154	2	02:45-08:15		0.033		0.011	0.018	0.007	0.018	0.005	3.0
" #158	MAY 10	15:38-17:08		0.576		-	0.22	-	0.191	-	1.0
COMMENTS;											

TABLE # 10

AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF

[illegible]

TABLE # 11AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF _____

MONITORING LOCATION / NUMBER	DATE '77	MONITORING TIME START / END	INSTANTANEOUS CONCENTRATION				MAXIMUM 60-MINUTE AVERAGE CONCENTRATION		MONITORING PERIOD AVERAGE CONCENTRATION		SCAN TIME Min.
			THC		NO ₂		THC	NO ₂	THC	NO ₂	
Sarnia #1	APRIL 22	11:06-12:56		4.38		-	2.1	-	1.85	-	1.0
" #3	26	10:23-13:08		17.6		1.29	13.0	0.10	9.86	0.08	1.0
" #4	26	14:26-18:56		9.56		1.68	2.6	0.06	1.92	0.05	1.0
" #7	27	12:14-17:59		4.29		0.21	2.7	0.07	2.14	0.06	1.0
" #8	MAY 5	17:26-19:26		3.72		0.10	1.5	0.04	1.46	0.04	1.0
" #9	5	19:41-22:26		11.7		0.69	2.5	0.11	2.04	0.08	1.0
" #10	5	23:41-08:56		17.4		1.47	3.4	0.13	1.97	0.07	1.0
" #12	6	10:20-11:50		9.23		0.15	2.8	0.04	2.80	0.03	1.0
" #13	9	14:16-15:26		2.50		0.06	1.4	0.02	1.39	0.02	1.0
" #14	9	15:44-17:34		2.35		0.09	1.4	0.04	1.38	0.04	1.0
" #15	9	17:47-19:27		2.51		0.08	1.6	0.04	1.60	0.04	1.0
" #17	9	20:43-09:13		35.7		0.41	2.7	0.06	1.84	0.05	1.0
" #18	10	13:54-17:24		10.7		0.19	8.4	.08	7.66	0.07	1.0
COMMENTS;											

TABLE # 12AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF _____

MONITORING LOCATION / NUMBER	DATE	MONITORING TIME START / END	INSTANTANEOUS CONCENTRATION				MAXIMUM 60-MINUTE AVERAGE CONCENTRATION		MONITORING PERIOD AVERAGE CONCENTRATION		SCAN TIME
			THC		NO ₂		THC	NO ₂	THC	NO ₂	
	'77		Min.	Max.	Min.	Max.					Min.
Sarnia #20	MAY 10	18:33-22:33		9.70		0.33	4.0	.08	2.88	0.06	1.0
" #21	10	22:49-09:34		11.9		0.49	4.5	.08	0.912	0.02	1.0
" #22	11	10:43-16:13		14.8		0.28	7.7	0.19	6.74	0.008	1.0
" #23	11	17:46-00:01		18.8		0.42	5.1	0.8	3.83	0.06	1.0
" #24	12	00:00-08:30		6.5		0.08	2.8	0.07	2.4	0.06	1.0
" #27	12	14:47-16:37		17.7		0.15	3.5	0.06	3.35	0.05	1.0
" #28	12	17:19-23:19		32.0		0.69	8.0	0.06	6.71	0.04	1.0
" #29	12	23:32-09:02		41.1		0.17	9.3	0.06	4.84	0.04	1.0
" #31	16	20:40-08:25		20.2		0.26	12.0	0.14	6.53	0.09	1.0
" #33	17	12:10-14:40		5.29		0.07	0.40	0.04	0.151	0.04	1.0
" #35	17	17:29-22:59		10.1		1.33	5.0	0.14	3.53	0.10	1.0
" #36	17	23:06-09:06		19.2		0.85	8.6	0.16	6.15	0.11	1.0
" #37	18	10:30-12:20		4.92		0.13	3.1	0.05	2.76	0.04	1.0
COMMENTS;											

TABLE # 13AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF _____

MONITORING LOCATION / NUMBER	DATE '77	MONITORING TIME START / END	INSTANTANEOUS CONCENTRATION				MAXIMUM 60-MINUTE AVERAGE CONCENTRATION		MONITORING PERIOD AVERAGE CONCENTRATION		SCAN TIME
			THC		NO ₂		THC	NO ₂	THC	NO ₂	
			Min.	Max.	Min.	Max.					Min.
Sarnia #41	MAY 18	17:10-06:40		24.5		1.31	6.9	0.10	4.88	0.06	1.0
" #42	19	06:57-08:37		7.55		0.11	4.2	0.05	3.76	0.04	1.0
" #43	19	10:01-12:16		21.3		0.20	5.2	0.06	3.67	0.04	1.0
" #46	19	18:32-07:02		16.3		0.79	4.7	0.12	2.02	0.04	1.0
" #47	20	09:57-11:57		8.39		0.19	1.3	0.06	1.23	0.05	1.0
" #48	24	19:41-06:44		10.6		-	4.2	-	3.31	-	1.0
" #49	25	09:14-19:59		38.9		0.25	24.0	0.08	8.64	0.05	1.0
" #50	25	21:28-07:28		18.6		0.21	12.0	0.08	8.10	0.06	1.0
" #52	26	11:15-15:16		21.1		0.256	5.1	0.05	3.94	0.04	1.0
" #53	26	17:31-08:31		24.7		0.43	3.8	0.08	2.12	0.05	1.0
" #54	27	09:04-12:34		8.08		0.23	4.0	0.08	2.70	0.08	1.0
" #55	30	13:50-14:56		4.31		0.12	2.0	0.07	1.95	0.06	1.0
" #57	31	13:50-21:20		13.1		0.35	4.7	0.07	2.91	0.05	1.0
COMMENTS;											

TABLE # 15AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF _____

MONITORING LOCATION / NUMBER	DATE	MONITORING TIME START / END	INSTANTANEOUS CONCENTRATION				MAXIMUM 60-MINUTE AVERAGE CONCENTRATION		MONITORING PERIOD AVERAGE CONCENTRATION		SCAN TIME
			THC		NO ₂		THC	NO ₂	THC	NO ₂	
	'77		Min.	Max.	Min.	Max.					Min.
Sarnia #101	APRIL 22	11:15-12:55		11.8		0.09	2.1	0.02	2.03	0.02	1.0
" #104	26	10:30-15:00		3.93		0.20	2.4	0.04	2.24	0.03	5.0
" #105	26	15:05-19:05		3.72		0.11	2.9	0.04	2.59	0.03	1.0
" #107	27	10:37-13:22		10.3		0.11	4.3	0.06	4.22	0.06	1.0
" #108	27	14:00-18:00		13.1		0.13	4.8	0.06	4.61	0.06	1.0
" #109	MAY 4	10:45-11:50		2.68		0.04	1.9	0.02	1.90	0.02	1.0
" #110	4	12:25-14:15		12.7		0.13	4.6	0.03	4.20	0.03	1.0
" #112	4	16:40-17:50		22.3		0.21	13.0	0.05	11.8	0.05	1.0
" #113	5	12:58-14:58		18.9		0.11	7.3	0.07	6.63	0.06	1.0
" #114	5	15:40-16:45		13.4		0.12	4.7	0.05	4.68	0.05	1.0
" #115	5	20:45-08:45		30.9		0.11	13.0	0.06	7.73	0.04	3.0
" 117	6	10:03-12:03		7.81		0.08	2.7	0.03	2.47	0.03	1.0
" 118	11	10:38-01:53		26.9		0.47	5.3	0.09	3.15	0.05	3.0
COMMENTS;											

TABLE # 16

AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF

MONITORING LOCATION / NUMBER	DATE	MONITORING TIME START / END	INSTANTANEOUS CONCENTRATION				MAXIMUM 60-MINUTE AVERAGE CONCENTRATION		MONITORING PERIOD AVERAGE CONCENTRATION		SCAN TIME
			THC		NO ₂		THC	NO ₂	THC	NO ₂	
	'77		Min.	Max.	Min.	Max.					Min.
Sarnia #120	MAY 12	14:23-15:43		36.9		0.08	16.0	0.04	15.9	0.04	1.0
" #122	12	17:17-08:47		64.4		0.72	44.0	0.48	14.7	0.15	3.0
" #123	13	10:05-11:10		36.9		0.09	15.0	0.05	15.0	0.05	1.0
" #124	16	20:36-08:36		10.7		0.09	5.7	0.06	4.27	0.04	3.0
" #125	17	11:35-12:43		2.58		0.09	2.3	0.04	2.26	0.04	1.0
" #128	18	11:20-12:30		0.758		0.14	0.31	0.12	0.275	0.12	1.0
" #129	18	13:55-15:01		14.7		0.11	11.0	0.08	10.1	0.08	1.0
" #130	18	17:45-08:15		-		0.14	-	0.10	-	0.06	3.0
" #131	19	08:25-12:10		10.4		0.45	0.50	0.07	0.224	0.02	1.0
" #132	19	16:45-08:30		11.7		0.04	1.6	0.04	0.456	0.02	3.0
" #133	20	10:23-11:23		7.9		0.066	0.50	0.03	0.47	0.031	1.0
" #135	24	18:14-06:44		25.6		0.10	9.5	0.05	2.14	0.04	3.0
" #136	25	09:24-10:24		6.22			1.2		1.00		1.0
COMMENTS;											

TABLE # 17AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF _____

MONITORING LOCATION / NUMBER	DATE '77	MONITORING TIME START / END	INSTANTANEOUS CONCENTRATION				MAXIMUM 60-MINUTE AVERAGE CONCENTRATION		MONITORING PERIOD AVERAGE CONCENTRATION		SCAN TIME Min.
			THC		NO ₂		THC	NO ₂	THC	NO ₂	
Sarnia #137	MAY 25	12:19-14:19		3.78		0.06	2.0	0.02	1.92	0.01	1.0
" #138	25	18:20-20:50		6.96		0.05	5.1	0.03	4.83	0.03	1.0
" #139	25	21:10-05:40		9.09		0.04	7.3	0.03	5.93	0.02	5.0
" #141	26	11:47-15:02		10.8		0.27	3.9	0.19	2.96	0.10	1.0
" #142	26	17:00-19:30		3.20		0.09	1.9	0.06	1.89	0.05	1.0
" #143	27	20:40-08:55		10.4		0.07	2.0	0.06	1.69	0.04	5.0
" #145	30	16:45-19:30		96.3		0.39	18.	0.16	7.55	0.08	1.0
" #146	31	11:20-13:35		220.0		0.69	38.0	0.18	38.0	0.17	1.0
" #147	31	21:11-06:26				0.07		0.05		0.03	5.0
" #150	JUNE 1	13:10-14:30		1.54		0.07	1.4	0.03	1.38	0.02	1.0
" #152	1	17:05-18:10		1.51		0.03	1.4	0.01	1.4	0.01	1.0
" #153	1	19:32-01:53		2.29		0.03	1.6	0.01	1.47	0.01	3.0
" #154	2	02:45-08:15		1.45		0.08	1.4	0.03	1.36	0.03	3.0
COMMENTS;											

TABLE # 18

AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF

[illegible]

TABLE # 19AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF _____

MONITORING LOCATION / NUMBER	DATE '77	MONITORING TIME START / END	INSTANTANEOUS CONCENTRATION O_3				MAXIMUM 60-MINUTE AVERAGE CONCENTRATION		MONITORING PERIOD AVERAGE CONCENTRATION		SCAN TIME Min.
			Min.	Max.	Min.	Max.	O_3		O_3		
Sarnia #1	APRIL 22	11:06-12:56		0.020			0.014		0.013		1.0
" #3	26	10:23-13:08		0.023			0.013		0.006		1.0
" #4	26	14:26-18:56		0.042			0.036		0.034		1.0
" #7	27	12:14-17:59		0.065			0.055		0.045		1.0
" #8	MAY 5	17:26-19:26		0.066			0.053		0.051		1.0
" #9	5	19:41-22:26		0.058			0.033		0.029		1.0
" #10	5	23:41-08:56		0.060			0.048		0.038		1.0
" #12	6	10:20-11:50		0.056			0.048		0.045		1.0
" #13	9	14:16-15:26		0.029			0.025		0.025		1.0
" #14	9	15:44-17:34		0.028			0.023		0.022		1.0
" #15	9	17:47-19:27		0.027			0.021		0.020		1.0
" #17	9	20:43-09:13		0.028			0.021		0.015		1.0
" #18	10	13:54-17:24		0.062			0.048		0.044		1.0
COMMENTS;											

TABLE # 20

AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF

MONITORING LOCATION / NUMBER	DATE '77	MONITORING TIME START / END	INSTANTANEOUS CONCENTRATION ₀₃				MAXIMUM 60-MINUTE AVERAGE CONCENTRATION		MONITORING PERIOD AVERAGE CONCENTRATION		SCAN TIME Min.
			Min.	Max.	Min.	Max.	₀₃		₀₃		
Sarnia #20	MAY 10	18:33-22:33		0.064			0.060		0.034		1.0
" #21	10	22:49-09:34		0.054			0.018		0.003		1.0
" #22	11	10:43-16:13		0.043			0.029		0.016		1.0
" #23	11	17:46-00:01		0.066			0.045		0.019		1.0
" #24	12	00:00-08:30		0.047			0.039		0.029		1.0
" #27	12	14:47-16:37		0.052			0.039		0.038		1.0
" #28	12	17:19-23:19		0.074			0.067		0.064		1.0
" #29	12	23:32-09:02		0.075			0.071		0.060		1.0
" #31	16	20:40-08:25		0.095			0.079		0.022		1.0
" #33	17	12:10-14:40		0.154			0.14		0.131		1.0
" #35	17	17:29-22:59		0.138			0.12		0.082		1.0
" #36	17	23:06-09:06		0.037			0.029		0.014		1.0
" #37	18	10:30-12:20		0.072			0.053		0.044		1.0
COMMENTS;											

TABLE # 21AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF _____

MONITORING LOCATION / NUMBER	DATE '77	MONITORING TIME START / END	INSTANTANEOUS CONCENTRATION ₀₃				MAXIMUM 60-MINUTE AVERAGE CONCENTRATION		MONITORING PERIOD AVERAGE CONCENTRATION		SCAN TIME Min.
			Min.	Max.	Min.	Max.	₀₃		₀₃		
Sarnia #41	MAY 18.	17:10-06:40		0.075			0.052		0.021		1.0
" #42	19	06:57-08:37		0.043			0.018		0.014		1.0
" #43	19	10:01-12:16		0.073			0.047		0.042		1.0
" #46	19	18:32-07:02		0.056			0.042		0.021		1.0
" #47	20	09:57-11:57		0.042			0.033		0.027		1.0
" #53	26	17:31-08:31		0.131			0.042		0.024		1.0
" #54	27	09:04-12:34		0.172			0.15		0.093		1.0
" #57	31	13:50-21:50		0.134			0.11		0.094		1.0
" #58	31	23:06-07:06		0.059			0.048		0.028		1.0
" #59	JUNE 1	15:07-16:37		0.037			0.033		0.029		1.0
" #60	1	16:50-20:20		0.044			0.040		0.036		1.0
" #61	1	20:37-07:52		0.049			0.046		0.027		1.0
" #64	2	15:41-19:26		0.028			0.019		0.016		1.0
COMMENTS;											

TABLE # 22

AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF

MONITORING LOCATION / NUMBER	DATE '78	MONITORING TIME START / END	INSTANTANEOUS CONCENTRATION				MAXIMUM 60-MINUTE AVERAGE CONCENTRATION		MONITORING PERIOD AVERAGE CONCENTRATION		SCAN TIME Min.
			SO ₂		TRS		SO ₂	TRS	SO ₂	TRS	
Sarnia II #1	OCT. 11	15:30-17:40		0.141		0.004	0.096	0.002	0.068	0.002	2.5
" #2	11	17:44-22:14		0.121		0.002	0.093	0.001	0.064	0.001	2.5
" #3	12	10:55-15:25		0.025		0.005	0.007	0.002	0.003	0.002	2.5
" #4	12	15:59-16:59		0.087		0.009	0.025	0.004	0.022	0.003	2.5
" #5	12	18:38-05:53		0.144		0.019	0.097	0.012	0.023	0.005	2.5
" #7	13	06:44-09:29		0.019		0.009	0.014	0.005	0.010	0.003	2.5
" #8	13	12:40-14:20		0.021		0.001	0.017	0.001	0.016	0.001	2.5
" #9	13	14:46-17:16		0.050		0.019	0.024	0.012	0.021	0.010	2.5
" #10	13	18:38-08:53		0.031		0.002	0.027	0.001	0.007	0.001	2.5
" #12	14	16:22-20:52		0.170		0.045	0.095	0.018	0.051	0.010	2.5
" #13	14	21:06-00:15		0.020		0.002	0.017	0.001	0.016	0.001	3.5
" #14	15	00:24-06:28		0.040		0.001	0.018	0.001	0.017	0.001	3.5
" #15	15	15:02-06:47		0.069		0.004	0.040	0.003	0.012	0.001	2.5
COMMENTS;											

TABLE # 23AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF _____

MONITORING LOCATION / NUMBER	DATE '78	MONITORING TIME START / END	INSTANTANEOUS CONCENTRATION				MAXIMUM 60-MINUTE AVERAGE CONCENTRATION		MONITORING PERIOD AVERAGE CONCENTRATION		SCAN TIME
			SO ₂		TRS		SO ₂	TRS	SO ₂	TRS	
Sarnia II #16	OCT. 16	14:02-15:12		0.030		0.007	0.009	0.002	0.009	0.002	2.5
" #17	16	15:21-17:21		0.305		0.023	0.11	0.012	0.082	0.009	1.5
" #18	16	17:56-23:11		0.064		0.076	0.038	0.040	0.022	0.022	2.5
" #19	17	12:24-15:54		0.346		0.004	0.057	0.002	0.046	0.002	2.5
" #21	21	17:31-19:46		0.029		0.001	0.011	0.001	0.006	0.001	1.5
" #22	17	20:03-02:18		0.003		0.001	0.002	0.001	0.001	0.001	1.5
" #23	18	15:43-16:49		0.024		0.003	0.019	0.002	0.018	0.002	1.5
" #24	19	14:00-17:30		0.119		0.006	0.048	0.001	0.029	0.001	2.5
" #25	19	19:16-09:46		0.051		0.073	0.023	0.007	0.004	0.005	1.5
" #26	20	14:29-17:14		0.279		0.015	0.047	0.006	0.041	0.004	1.5
" #27	20	17:51-09:21		0.119		0.003	0.042	0.003	0.013	0.001	1.5
" #28	21	14:47-15:59		0.190		0.014	0.087	0.005	0.084	0.005	1.5
" #29	21	16:24-20:09		0.177		0.028	0.13	0.013	0.109	0.009	1.5
COMMENTS;											

TABLE # 24

AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF

MONITORING LOCATION / NUMBER	DATE '78	MONITORING TIME START / END	INSTANTANEOUS CONCENTRATION				MAXIMUM 60-MINUTE AVERAGE CONCENTRATION		MONITORING PERIOD AVERAGE CONCENTRATION		SCAN TIME Min.
			SO ₂		TRS		SO ₂	TRS	SO ₂	TRS	
Sarnia II #31	OCT. 21	22:20-08:20		0.181		0.041	0.14	0.019	0.112	0.012	1.5
" #32	22	10:51-16:21		0.243		0.019	0.15	0.009	0.096	0.005	1.5
" #33	22	17:33-16:03		0.088		0.004	0.063	0.001	0.006	0.001	2.5
" #38	26	17:39-05:39		0.025		0.001	0.016	0.001	0.004	0.001	1.5
" #40	27	16:39-08:39		0.105		0.047	0.046	0.010	0.016	0.002	2.0
" #41	29	16:50-09:14		0.007		0.001	0.003	0.001	0.001	0.001	2.0
" #42	30	17:38-21:23		0.059		0.006	0.039	0.006	0.032	0.004	2.5
" #43	31	00:28-08:45		0.087		0.001	0.072	0.001	0.030	0.001	3.5
" #44	31	15:07-16:27		0.011		0.005	0.004	0.004	0.004	0.004	2.5
" #47	NOV. 1	11:18-13:48		0.178		0.003	0.063	0.002	0.040	0.002	2.5
" #49	1	19:35-08:35		0.044		0.021	0.027	0.005	0.015	0.002	2.5
" #52	2	11:50-15:50		0.062		0.003	0.032	0.002	0.021	0.001	1.0
" #53A	3	15:14-17:29		0.069		0.001	0.031	0.001	0.032	0.001	1.5
COMMENTS;											

TABLE # 25

AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF

MONITORING LOCATION / NUMBER	DATE '78	MONITORING TIME START / END	INSTANTANEOUS CONCENTRATION THC		CONCENTRATION TH-M		MAXIMUM 60-MINUTE AVERAGE CONCENTRATION		MONITORING PERIOD AVERAGE CONCENTRATION		SCAN TIME Min.
			Min.	Max.	Min.	Max.	THC	TH-M	THC	TH-M	
Sarnia II #1	OCT. 11	15:30-17:40		3.29		2.08	2.7	1.6	2.62	1.59	2.5
" #2	11	17:44-22:14		4.28		2.81	2.8	1.7	2.38	1.48	2.5
" #3	12	10:55-15:25		8.24		5.48	4.7	3.3	3.38	2.35	2.5
" #4	12	15:59-16:59		1.84		1.35	1.4	0.93	1.36	0.92	2.5
" #6	12	18:38-05:53		17.0		12.4	5.3	3.7	3.53	2.45	2.5
" #7	13	06:44-09:29		11.5		6.40	5.8	3.6	4.08	2.76	2.5
" #8	13	12:40-14:20		3.91		2.58	2.8	1.7	2.53	1.54	2.5
" #9	13	14:46-17:16		41.5		25.6	21.	14.	17.7	11.3	2.5
" #10	13	18:38-08:53		9.77		8.23	4.5	2.8	2.80	1.77	2.5
" #12	14	16:22-20:52		9.41		5.44	4.6	2.8	4.21	2.54	2.5
" #13	14	21:06-00:15		6.76		4.18	4.9	3.0	3.34	1.99	3.5
" #14	15	00:24-06:28		33.3		21.6	8.1	5.1	3.74	2.25	3.5
" #15	15	15:02-06:47		3.07		1.47	2.0	1.0	1.40	0.707	2.5
COMMENTS; TH-M = non-methane component of THC											

TABLE # 26AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF _____

MONITORING LOCATION / NUMBER	DATE	MONITORING TIME START / END	INSTANTANEOUS CONCENTRATION				MAXIMUM 60-MINUTE AVERAGE CONCENTRATION		MONITORING PERIOD AVERAGE CONCENTRATION		SCAN TIME
			THC		TH-M		THC	TH-M	THC	TH-M	
	'78		Min.	Max.	Min.	Max.					Min.
Sarnia II #16	OCT. 16	14:02-15:12		5.58		2.54	2.9	1.4	2.76	1.36	2.5
" #17	16	15:21-17:21		11.1		8.13	4.1	2.1	3.62	1.96	1.5
" #18	16	17:56-23:11		20.9		10.4	8.2	4.2	4.16	2.08	2.5
" #19	17	12:24-15:54		17.7		11.4	6.4	3.8	3.89	2.22	2.5
" #21	17	17:31-19:46		14.7		10.2	6.0	3.5	3.96	2.26	1.5
" #22	17	20:03-02:18		30.3		20.3	14	8.4	11.6	6.45	1.5
" #24	19	14:00-17:30		6.04		3.46	4.2	2.3	3.60	1.94	2.5
" #25	19	19:16-09:46		31.3		19.2	15	8.5	5.23	2.92	1.5
" #26	20	14:29-17:14		12.7		5.67	4.6	2.3	4.39	2.19	1.5
" #27	20	17:51-09:21		9.33		2.44	3.6	1.7	2.86	1.32	1.5
" #28	21	14:47-15:59		9.30		4.82	5.1	2.7	5.06	2.66	1.5
" #29	21	16:24-20:09		10.4		8.88	6.5	3.6	6.05	3.24	1.5
" #31	21	22:20-08:20		9.45		5.28	6.2	3.3	5.07	2.64	1.5
COMMENTS;											

TABLE # 27AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF _____

MONITORING LOCATION / NUMBER	DATE	MONITORING TIME START / END	INSTANTANEOUS CONCENTRATION				MAXIMUM 60-MINUTE AVERAGE CONCENTRATION		MONITORING PERIOD AVERAGE CONCENTRATION		SCAN TIME
			THC		TH-M		THC	TH-M	THC	TH-M	Min.
			Min.	Max.	Min.	Max.					
Sarnia II #32	OCT. 22	10:51-16:21		19.1		3.46	4.3	2.0	3.70	1.77	1.5
" #33	22	17:33-16:03		19.4		10.6	6.6	3.4	2.05	0.949	2.5
" #35	24	16:20-08:35		6.46		3.60	5.1	2.7	4.62	2.39	1.5
" #36	25	19:16-08:46		43.2		23.7	24	14	8.84	4.50	1.5
" #38	26	17:39-05:39		19.4		13.2	11	6.7	5.84	3.07	1.5
" #40	27	16:39-08:39		13.4		7.54	8.1	4.5	5.36	2.85	2.0
" #41	29	16:50-09:14		13.8		9.59	5.3	3.4	2.31	1.42	2.0
" #42	30	17:38-21:23		5.02		2.59	4.4	2.3	3.52	1.81	2.5
" #43	31	00:28-08:45		10.3		6.19	8.7	5.2	4.04	2.24	3.5
" #44	31	15:07-16:27		3.47		1.92	3.0*	1.5	2.96	1.51	2.5
" #47	NOV. 1	11:18-13:48		19.8		12.1	5.4	2.8	4.72	2.64	2.5
" #49	1	19:35-08:35		8.16		5.24	5.2	3.0	4.07	2.32	2.5
" #52	2	11:50-15:50		21.1		14.3	6.5	3.7	5.13	2.91	1.0
COMMENTS;											

TABLE # 28

AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF

[illegible]

TABLE # 29

AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF

MONITORING LOCATION / NUMBER	DATE '78	MONITORING TIME START / END	INSTANTANEOUS CONCENTRATION				MAXIMUM 60-MINUTE AVERAGE CONCENTRATION		MONITORING PERIOD AVERAGE CONCENTRATION		SCAN TIME Min.
			NO ₂		O ₃		NO ₂	O ₃	NO ₂	O ₃	
Sarnia II #1	OCT. 11	15:30-17:40		0.07		0.036	0.06	0.028	0.05	0.019	2.5
" #2	11	17:44-22:14		0.06		0.047	0.04	0.036	0.04	0.014	2.5
" #3	12	10:55-15:25		0.08		0.049	0.02	0.043	0.02	0.038	2.5
" #4	12	15:59-16:59		0.03		0.037	0.02	0.030	0.02	0.030	2.5
" #6	12	18:38-05:53		0.14		0.028	0.06	0.019	0.04	0.006	2.5
" #7	13	06:44-09:29		0.25		0.012	0.06	0.002	0.04	0.001	2.5
" #8	13	12:40-14:20		0.03		0.029	0.01	0.027	0.01	0.027	2.5
" #9	13	14:46-17:16		0.15		0.025	0.05	0.011	0.05	0.008	2.5
" #10	13	18:38-08:53		0.13		0.031	0.03	0.029	0.02	0.024	2.5
" #12	14	16:22-20:52		0.05		0.034	0.03	0.026	0.02	0.018	2.5
" #13	14	21:06-00:15		0.04		0.025	0.03	0.017	0.02	0.011	3.5
" #14	15	00:24-06:28		0.04		0.028	0.03	0.024	0.01	0.018	3.5
" #15	15	15:02-06:47		0.04		0.026	0.02	0.022	0.01	0.018	2.5
COMMENTS;											

TABLE # 30

AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF

MONITORING LOCATION / NUMBER	DATE '78	MONITORING TIME START / END	INSTANTANEOUS CONCENTRATION				MAXIMUM 60-MINUTE AVERAGE CONCENTRATION		MONITORING PERIOD AVERAGE CONCENTRATION		SCAN TIME Min.
			NO ₂		O ₃		NO ₂	O ₃	NO ₂	O ₃	
Sarnia II #16	OCT. 16	14:02-15:12		0.15		0.033	0.02	0.027	0.02	0.027	2.5
" #17	16	15:21-17:21		0.08		0.035	0.02	0.024	0.02	0.023	1.5
" #18	16	17:56-23:11		0.05		0.030	0.03	0.026	0.02	0.016	2.5
" #19	17	12:24-15:54		0.04		0.044	0.02	0.041	0.01	0.036	2.5
" #21	17	17:31-19:46		0.02		0.043	0.02	0.035	0.01	0.026	1.5
" #22	17	20:03-02:18		0.01		0.031	0.01	0.028	0.01	0.021	1.5
" #23	18	15:43-16:49		0.04		0.033	0.04	0.020	0.03	0.020	1.5
" #24	19	14:00-17:30		0.05		0.031	0.03	0.024	0.02	0.020	2.5
" #25	19	19:16-09:46		0.17		0.026	0.03	0.019	0.02	0.010	1.5
" #27	20	17:51-09:21		0.05		0.021	0.03	0.015	0.03	0.006	1.5
" #28	21	14:47-15:59		0.09		0.057	0.04	0.049	0.04	0.048	1.5
" #29	21	16:24-20:09		0.06		0.052	0.04	0.044	0.04	0.044	1.5
" #31	31	22:20-08:20		0.08		0.018	0.05	0.014	0.04	0.005	1.5
COMMENTS;											

TABLE # 31

AMBIENT AIR SURVEY IN SARNIA

Units - PPM

GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF

MONITORING LOCATION / NUMBER	DATE '78	MONITORING TIME START / END	INSTANTANEOUS CONCENTRATION				MAXIMUM 60-MINUTE AVERAGE CONCENTRATION		MONITORING PERIOD AVERAGE CONCENTRATION		SCAN TIME Min.
			NO ₂		O ₃		NO ₂	O ₃	NO ₂	O ₃	
Sarnia II #32	OCT. 22	10:51-16:21		0.12		0.056	0.06	0.036	0.06	0.025	1.5
" #33	22	17:33-16:03		0.09		0.048	0.08	0.039	0.01	0.020	2.5
" #35	24	16:20-08:35		0.05		0.031	0.03	0.027	0.02	0.012	1.5
" #36	25	19:16-08:46		0.06		0.022	0.04	0.019	0.02	0.008	1.5
" #38	26	17:39-05:39		0.40		0.023	0.06	0.017	0.03	0.008	1.5
" #40	27	16:39-08:39		0.25		0.042	0.06	0.037	0.04	0.010	2.0
" #41	29	16:50-09:14		0.34		0.033	0.06	0.029	0.02	0.007	2.0
" #42	30	17:38-21:23		0.07		0.007	0.06	0.004	0.05	0.003	2.5
" #43	31	00:28-08:45		0.08		0.002	0.07	0.001	0.04	0.001	3.5*
" #44	31	15:07-16:27		0.02		0.034	0.01	0.031	0.01	0.030	2.5
" #47	NOV. 1	11:18-13:48		0.10		0.054	0.03	0.038	0.03	0.031	2.5
" #49	1	19:35-08:35		0.10		0.009	0.04	0.002	0.04	0.001	2.5
" #52	2	11:50-15:50		0.07		0.055	0.03	0.048	0.02	0.036	1.0
COMMENTS;											

TABLE # 33

GAS CHROMATOGRAPH -- SURVEY IN SARNIA , 1977

PLANT : <u>IMPERIAL OIL, EAST OF VIDAL (NORTH)</u>										
SAMPLE NUMBER	DATE	TIME AND LOCATION	MAP REF	CONCENTRATIONS -- PPM						COMMENT
				C ₂ H ₄	C ₂ H ₆	C ₃ H ₆	C ₃ H ₈	V.C.	C ₄ H ₁₀	
1	May 4	(10:50-11:20) DOWNWIND OF V.C. 200 FT. W. OF FENCE (E)	(E)	0.8	-	-	-	-	-	DOWNWIND OF PVC PLANT ↓
2	"	(10:52-11:22) GATEHOUSE (E)	(E)	0.7	-	-	-	-	-	
3	"	(10:55-11:25) IMPERIAL OIL - POLYETHYLENE (E) 500 FT. W. OF POLYETHYLENE PLANT	(E)	1.6	0.14	0.59	-	-	-	
4	"	(11:04-11:34) UPWIND OF IMP. OIL - ½ MI. S OF SCOTT - ST. ANDREW INTERSECTION ON SCOTT STREET	(F)	0.7	-	-	-	-	-	
5	May 5	(10:11-10:41) VINYL SAME AS # 13	(A)	1.4	-	-	-	-	-	DOWNWIND OF PVC PLANT WNW WINDS ↓
6	"	(10:12-10:42) GATE SAME AS # 14	(B)	1.2	-	-	-	6.64	-	
7	"	(10:13-10:43) POLYETHYLENE SAME AS # 15	(C)	0.2	-	-	-	4.42	-	
8	"	(10:22-10:52) UPWIND SAME AS # 16	(D)	-	-	-	-	-	-	

TABLE # 34GAS CHROMATOGRAPH -- SURVEY IN SARNIA, 1977PLANT : IMPERIAL OIL, EAST OF VIDAL (NORTH)

SAMPLE NUMBER	DATE	TIME AND LOCATION	MAP REF	CONCENTRATIONS -- PPM						COMMENT
				C ₂ H ₄	C ₂ H ₆	C ₃ H ₆	C ₃ H ₈	V.C.	C ₄ H ₁₀	
9	May 5	(14:50-15:20) SAME AS #13	(A)	0.2	-	-	-	-	-	DOWNWIND OF PVC PLANT
10	"	(14:52-15:22) SAME AS #14	(B)	0.2	-	-	-	-	-	↓
11	"	(14:54-15:24) SAME AS #15	(C)	0.1	-	-	-	-	-	
12	"	(15:01-15:31) SAME AS #16	(D)	0.4	-	-	-	-	-	UPWIND
13	May 6	(10:27-10:57) EAST END OF KENNY ROAD	(A)	2.1	-	-	-	-	-	DOWNWIND OF IMPERIAL OIL
14	"	(10:04-10:41) KENNY ROAD, ACROSS FROM COOLING TOWER	(B)	1.8	-	-	-	-	-	WNW WINDS
15	"	(10:10-10:40) KENNY AND VIDAL RD.	(C)	2.7	-	-	-	-	-	↓
16	"	(10:07-10:37) VIDAL RD., NORTH OF IMPERIAL ROAD	(D)	2.3	0.34	-	1.2	-	-	UPWIND

TABLE # 35GAS CHROMATOGRAPH -- SURVEY IN SARNIA, 1977

PLANT : <u>IMPERIAL OIL, EAST OF VIDAL (NORTH)</u>										
SAMPLE NUMBER	DATE	TIME AND LOCATION	MAP REF	CONCENTRATIONS -- PPM						COMMENT
				C ₂ H ₄	C ₂ H ₆	C ₃ H ₆	C ₃ H ₈	V.C.	C ₄ H ₁₀	
17	May 10	(12:36-13:06) W. END OF KENNY ROAD.	(C)	0.6	-	-	-	-	-	NORTHERLY WINDS (DOWNWIND) ↓
18	"	(12:37-13:07) 150 m. E. OF #17	(C)	0.4	-	-	-	-	-	
19	"	(12:38-18:08) 300 m. E. OF #17	(C)	0.5	-	-	0.07	-	-	
20	"	(12:46-13:16) GATE OF IMP. OIL ACROSS FROM KENNY - VIDAL INTERSECTION	(H)	-	-	-	-	-	-	
21	May 11	(11:05-11:35) 250 m. S. OF V.C. PLANT 250 m. E. OF VIDAL ROAD	(G)	0.2	-	-	-	-	-	
22	"	(11:04-11:43) 75 m. E. OF #21	(G)	0.3	-	-	-	-	-	

TABLE # 36GAS CHROMATOGRAPH -- SURVEY IN SARNIA, 1977


PLANT : <u>IMPERIAL OIL , EAST OF VIDAL (NORTH)</u>										
SAMPLE NUMBER	DATE	TIME AND LOCATION	MAP REF	CONCENTRATIONS -- PPM						COMMENT
				C ₂ H ₄	C ₂ H ₆	C ₃ H ₆	C ₃ H ₈	V.C.	C ₄ H ₁₀	
23	May 11	(11:02-11:32) 150 m. E. OF #21	(G)	0.2	-	-	-	-	-	NORTHERLY WINDS (DOWNWIND)
24	"	(11:12-11:42) DIRECTLY IN FRONT OF IMP. OIL GATE HOUSE	(E)	0.1	-	-	-	-	-	UPWIND
25	"	COOPERATIVE SAMPLING WITH IMP. OIL - 100 m. S. OF P.V.C.	(I)	-	0.06	-	0.2	-	-	NORTHERLY WINDS (DOWNWIND)
26	"	THIER RESULTS FOR P.V.C. (ppm), 0.1 MIN, 0.14 MAX, 0.12 AVG.		-	trace	-	-	-	-	
				-	-	-	-	-	-	
				-	-	-	-	0.71	-	
				-	-	-	-	-	-	
27	May 25	(8:17-8:47) 250 m. S. OF IMP. OIL V.C. PLANT & 250 m. E. OF VIDAL ROAD	(G)	-	-	-	-	-	-	
28	"	(8:21-8:51) 70 m. E. of #27	(G)	-	-	-	-	-	-	
29	"	(8:25-8:55) 130 m. E of #27	(G)	-	-	-	-	-	-	

TABLE # 37

GAS CHROMATOGRAPH -- SURVEY IN SARNIA, 1977

PLANT : <u>IMPERIAL OIL, EAST OF VIDAL (NORTH)</u>										
SAMPLE NUMBER	DATE	TIME AND LOCATION	MAP REF	CONCENTRATIONS -- PPM						COMMENT
				C ₂ H ₄	C ₂ H ₆	C ₃ H ₆	C ₃ H ₈	V.C.	C ₄ H ₁₀	
30	May 25	15:00 hrs. P.V.C. PLANT IMP OIL (BAGS ANALYZED BY IMP. OIL)		0.04	-	0.03	-	-	-	DOWNWIND ↓
31	"	"		-	-	-	-	-	-	
				-	0.07	-	-	-	-	
32	"	15:00 hrs. P.V.C. PLANT IMP. OIL (BAGS ANALYZED BY IMP. OIL)		-	-	-	-	-	-	
				-	-	-	-	-	-	
33	"	"		-	-	-	-	-	-	
				-	-	-	-	-	-	

TABLE # 38

GAS CHROMATOGRAPH -- SURVEY IN SARNIA, 1977

PLANT : IMPERIAL OIL, ETHYLENE AND/OR P.V.C. PLANT (WIND DIRECTION UNKNOWN) NORTH VIDAL

SAMPLE NUMBER	DATE	TIME AND LOCATION	MAP REF	CONCENTRATIONS -- PPM						COMMENT
				C ₂ H ₄	C ₂ H ₆	C ₃ H ₆	C ₃ H ₈	V.C.	C ₄ H ₁₀	
1	Apr. 22	(9:50-10:20) KENNY ROAD.	(C)	2.0	2.2	0.8	0.06	0.07	0.01	
2	"	(10:10-10:40) IMP. OIL GATE AT CLIFFORD	(J)	1.0	0.5	0.14	0.10	0.15	0.05	
3	"	(10:30-11:00) ST. ANDREW AND VIDAL	(M)	2.3	0.7	-	-	0.05	-	
4	Apr. 27	(9:50-10:20) KENNY & VIDAL INTERSECTION, AT R.R. TRACKS	(C)	0.8	0.4	0.2	0.1	1.0	0.09	
5	"	(9:20-9:50) FIELD E. OF SEWAGE PLANT	(N)	1.3	0.7	0.26	-	-	-	
6	"	(10:00-10:30)	(N)	1.5	0.45	0.17	0.01	0.10	-	
7	"	(14:00-14:30) CLIFFORD & VIDAL	(J)	0.9	0.4	0.07	0.17	-	-	

TABLE # 39GAS CHROMATOGRAPH -- SURVEY IN SARNIA, 1977

PLANT : <u>IMPERIAL OIL, WEST OF VIDAL (NORTH)</u>										
SAMPLE NUMBER	DATE	TIME AND LOCATION	MAP REF	CONCENTRATIONS -- PPM						COMMENT
				C ₂ H ₄	C ₂ H ₆	C ₃ H ₆	C ₃ H ₈	V.C.	C ₄ H ₁₀	
1	May 6	(10:27-10:57) EAST END OF KENNY ROAD.	(A)	2.1	-	-	-	-	-	WNW WINDS (DOWNWIND) ↓
2	"	(10:04-10:41) KENNY ROAD ACROSS FROM COOLING TOWER	(B)	1.8	-	-	-	-	-	
3	"	(10:10-10:40) KENNY AND VIDAL ROAD.	(C)	2.7	-	-	-	-	-	
4	"	(10:07-10:40) VIDAL RD., N. OF IMPERIAL ROAD.	(D)	2.3	0.34	-	1.2	-	-	UPWIND
5	May 12	(10:52-11:22) 200 m. N. OF VIDAL-HURON INTERSECTION, W. SIDE OF VIDAL	(L)	-	0.19	-	-	-	-	DOWNWIND ↓
6	"	(11:24-11:54) VIDAL-HURON INTERSECTION, W. SIDE OF VIDAL	(L)	-	0.54	-	-	-	-	
7	"	(11:05-11:35) 100 m. S. OF VIDAL-HURON INTERSECTION, W. SIDE OF VIDAL	(L)	-	-	-	-	-	-	
8	"	(11:41-12:11) DIRECTLY ACROSS FROM ENTRANCE TO IMP. OIL	(E)	0.48 0.12	- 0.45	1.05 -	- 0.85	- -	- -	

TABLE # 40

GAS CHROMATOGRAPH -- SURVEY IN SARNIA, 1977PLANT : IMPERIAL OIL, WEST VIDAL (NORTH)

SAMPLE NUMBER	DATE	TIME AND LOCATION	MAP REF	CONCENTRATIONS -- PPM						COMMENT
				C ₂ H ₄	C ₂ H ₆	C ₃ H ₆	C ₃ H ₈	V.C.	C ₄ H ₁₀	
9	May 12	(11:46-12:16) 100 m. S. OF #8 - W. SIDE OF VIDAL	(E)	-	-	-	-	-	-	WNW WINDS ↓ SSW WINDS (DOWNWIND) ↓
10	"	(11:54-12:24) 230 m. S. OF #8 - W. SIDE OF VIDAL	(E)	0.31	0.69	0.43	-	-	-	
11	May 18	(10:47-11:17) 35 m. N. OF ENTRANCE TO IMP. OIL	(D)	0.06	0.14	-	-	-	-	
12	"	(10:55-11:25) DIRECTLY ACROSS FROM ENTRANCE TO IMP. OIL	(E)	0.06	0.23	0.05	-	-	-	
13	"	(11:01-11:31) 35 m S. OF ENTRANCE TO IMP. OIL	(E)	3.8 4.2	1.34 0.08	1.29 -	- 0.16	- -	- -	
14	"	(11:38-12:08) 10 m. W. OF VIDAL CLIFFORD INTERSECTION		-	-	-	-	-	-	
15	"	(11:43-12:13) CLIFFORD SHAMROCK INTERSECTION	(J)	- 0.06	- -	0.05 0.04	- 0.23	- -	- -	
16	"	(11:48-12:18) 10 m. E. OF CLIFFORD -ROSE INTERSECTION	(K)	- 0.09	- 0.05	0.15 -	- 0.32	- -	- -	

TABLE # 41GAS CHROMATOGRAPH -- SURVEY IN SARNIA, 1977

PLANT : <u>DOW CHEMICAL (SOUTH)</u>										
SAMPLE NUMBER	DATE	TIME AND LOCATION	MAP REF	CONCENTRATIONS -- PPM						COMMENT
				C_2H_4	C_2H_6	C_3H_6	C_3H_8	V.C.	C_4H_{10}	
1	May 12	(13:11-13:41) 150 m. S.W. OF DOW'S V.C. PLANT	(Q)	-	-	-	-	-	-	W WINDS DOWNWIND ↓
2	"	(13:15-13:45) 100 m S. OF DOW'S V.C. PLANT	(Q)	0.40	0.35	-	0.32	-	-	
3	"	(13:17-13:47) 60 m. S.E. OF DOW'S V.C. PLANT	(Q)	0.34 0.32	0.22 0.27	0.19 -	0.37 0.43	- -	- -	
4	May 13	(9:50-10:20) N. CORNER OF ADMINISTRATION PARKING LOT, 120 m. FROM V.C. PLANT	(O)	4.74	3.25	0.22	-	-	-	N WINDS ↓
5	"	(9:58-10:28) 60 m WEST OF GATE, S. SIDE OF THE ENT- RANCE IN PROP. BOUND.	(O)	0.52	1.42	1.47	-	-	-	
6	"	(10:05-10:35) GATEHOUSE ENTRANCE TO DOW SOUTH- SIDE	(P)	1.84	1.96	0.34	-	-	-	
7	May 17	(12:00-12:30) MAIN ROAD TO DOW & FIRST SIDE RD. TO NORTH INTERSECTION	(Q)	-	0.16	-	-	-	-	NW WINDS ↓
8	"	(11:57-12:27) 40 m. N. OF #7 ALONG THE SIDE ROAD	(Q)	-	0.18	-	-	-	-	

TABLE # 42

GAS CHROMATOGRAPH -- SURVEY IN SARNIA, 1977

PLANT : <u>DOW CHEMICAL (SOUTH)</u>										
SAMPLE NUMBER	DATE	TIME AND LOCATION	MAP REF	CONCENTRATIONS -- PPM						COMMENT
				C ₂ H ₄	C ₂ H ₆	C ₃ H ₆	C ₃ H ₈	V.C.	C ₄ H ₁₀	
9	May 17	(11:53-12:23) 80 m. N. OF #7	(Q)	-	-	-	-	-	-	N WINDS ↓ NNW WINDS ↓
10	"	(11:50-12:20) 120 m. N. OF #7	(Q)	0.22	0.74	-	-	-	-	
11	"	(15:39-16:09) SAME AS #7	(Q)	-	-	-	-	-	-	
12	"	(15:44-16:14) SAME AS # 8	(Q)	-	-	-	-	-	-	
13	"	(15:47-16:17) SAME AS #9	(Q)	-	-	-	-	-	-	
14	"	(15:53-16:23) SAME AS #10	(Q)	-	-	-	-	-	-	
15	May 18	(15:35-16:05) ROAD TO DOW & FIRST ROAD ON THE LEFT INTERSECTION	(R)	-	-	-	-	-	-	
16	"	(15:25-15:55) 130 m. N. OF BAG #15 LOCATED BESIDE THE DIRT ROAD	(R)	- 0.05	-	-	-	-	-	
17	"	(15:55-16:25) 80 m. N. OF BAG # 15 LOCATED BESIDE THE DIRT ROAD	(R)	- 0.06	-	- 0.37	-	- 0.04	-	

TABLE # 43GAS CHROMATOGRAPH -- SURVEY IN SARNIA, 1977

PLANT : <u>DOW CHEMICAL</u> (SOUTH)										
SAMPLE NUMBER	DATE	TIME AND LOCATION	MAP REF	CONCENTRATIONS -- PPM						COMMENT
				C_2H_4	C_2H_6	C_3H_6	C_3H_8	V.C.	C_4H_{10}	
18	May 25	(10:05-10:35) 20 m. N. OF BAG #21	(R)	-	-	-	-	-	-	N WINDS ↓
19	"	(10:08-10:38) 100 m. N. OF BAG #20	(Q)	-	-	-	-	-	-	
20	"	(10:11-10:41) INTERSECTION OF CHURCHILL & 1st ROAD TO LEFT GOING INTO DOW	(S)	-	-	-	-	-	-	
21	"	(10:14-10:44) ON ROAD TO DOW 60 m E. OF GATEHOUSE	(O)	0.30	1.10	-	-	-	-	

TABLE # 44

GAS CHROMATOGRAPH -- SURVEY IN SARNIA , 1977

PLANT : <u>SUNOCO (SOUTH)</u>										
SAMPLE NUMBER	DATE	TIME AND LOCATION	MAP REF	CONCENTRATIONS -- PPM						COMMENT
				C ₂ H ₄	C ₂ H ₆	C ₃ H ₆	C ₃ H ₈	V.C.	C ₄ H ₁₀	
1	May 20	(9:55-10:25) 120 m. W. OF #5	(T)	- 0.33	- -	- -	- -	- -	- -	N WINDS (DOWNWIND) ↓
2	"	(9:59-10:29) 90 m. W. OF #5	(T)	-	-	-	-	-	-	
3	"	(10:05-10:35) 60 m. W. OF #5	(T)	-	-	-	-	-	-	
4	"	(10:07-10:37) 30 m. W. OF #5	(T)	-	-	-	-	-	-	
5	"	(10:09-10:39) DIRECTLY ACROSS FROM LASALLE, WAHBOOSE INTERSECTION 30 m S. OF LASALLE	(T)	-	-	-	-	-	-	
6	May 25	(17:40-18:15) 150 m. E. OF HWY #40 ON SUNOCO RD.	(U)	0.25	-	0.42	-	-	-	VERY LIGHT NORTH WINDS ↓
7	"	(17:45-19:10) 180 m. E. OF HWY #40 ON SUNOCO RD.	(U)	0.26 0.35	0.17 -	- -	- -	- -	- -	
8	"	(17:50-18:40) 120 m. E. OF HWY. #40 ON SUNOCO RD.	(U)	-	-	-	-	-	-	↓

TABLE # 45

GAS CHROMATOGRAPH -- SURVEY IN SARNIA , 1977

PLANT : SHELL AND DUPONT (CORUNNA)										
SAMPLE NUMBER	DATE	TIME AND LOCATION	MAP REF	CONCENTRATIONS -- PPM						COMMENT
				C ₂ H ₄	C ₂ H ₆	C ₃ H ₆	C ₃ H ₈	V.C.	C ₄ H ₁₀	
1	May 19	(14:55-15:25) 100 m. N. OF BECKWITH(CORUNNA) 15 m. W. OF R.R.	(V)	-	-	-	-	-	-	N WINDS <

TABLE # 46

GAS CHROMATOGRAPH -- SURVEY IN SARNIA, 1977

PLANT : SHELL AND DUPONT (CORUNNA)

SAMPLE NUMBER	DATE	TIME AND LOCATION	MAP REF	CONCENTRATIONS -- PPM						COMMENT
				C ₂ H ₄	C ₂ H ₆	C ₃ H ₆	C ₃ H ₈	V.C.	C ₄ H ₁₀	
7	May 11	(15:45-16:15) BECKWITH ST. 20 m. N., 20 m. E. OF R.R.	(V)	0.08	-	-	-	-	-	N WINDS ↓
8	"	(15:42-16:12) 230 m. N. OF BECKWITH ST., 15 m. W. OF R.R.	(V)	-	-	-	-	-	-	
9	"	(16:00-16:30) 15 m. N. OF LASALLE ROAD, 30 m. W. of R.R.	(W)	-	-	-	-	-	-	
10	"	(17:57-18:27) BECKWITH - COULBURN INTERSECTION	(X)	0.09	-	-	-	-	-	VERY LIGHT SE WINDS ↓
11	May 11	(18:00-18:30) 25 m. E. of #10		0.09	-	-	-	-	-	
12	"	(18:03-18:33) 25 m. E. of #11	(X)	0.09	-	-	-	-	-	
13	"	(18:06-18:34) 25 m. E. OF #12	(X)	0.09	-	-	-	-	-	

TABLE # 47

GAS CHROMATOGRAPH -- SURVEY IN SARNIA, 1977PLANT : OTHER

SAMPLE NUMBER	DATE	TIME AND LOCATION	MAP REF	CONCENTRATIONS -- PPM						COMMENT
				C ₂ H ₄	C ₂ H ₆	C ₃ H ₆	C ₃ H ₈	V.C.	C ₄ H ₁₀	
1	Apr. 27	(11:10-10:40) CITY HALL ON CHRISTINA ST.	(Y)	0.35	0.05	-	-	-	-	S WINDS ↓
2	"	(11:15-11:45) POST OFFICE CHRISTINA ST.	(Z)	0.38	0.13	-	-	-	-	
CLEAN AIR #1	"	CLEAN AIR, HWY #7, 10 m. E. OF HWY #21	(A1)	0.15	0.07	-	-	-	-	
CLEAN AIR #2	"		(A1)	0.23	0.07	-	-	-	-	

SARNIA, 1978

[illegible]

SARNIA, 1978

[illegible]

SARNIA, 1978

[illegible]

SARNIA, 1978

[illegible]

SARNIA, 1978

TABLE 52

[illegible]

TABLE 53

SARNIA 78 - HYDROCARBONS (PPB)

Compound	Standard(s) or Provisional Guideline (P.G.)	South Vidal	Central Vidal	North Vidal	Corunna	Sarnia
Pentane	-	86.7	25.1	93.7	34	26.2
Hexane	-	66.1	2.6	35.1	15	8.3
Heptane	-	18.2	3.2	14.0	7.5	6.0
Benzene	3,000(S)	15.7	158	39.2	14	6.1
Octane	-	6.3	0.3	9.8	5.5	3.7
Toluene	530(S)	52.5	5.5	40.7	14.8	20
Nonane	-	4.1	1.2	12.0	4.3	3.5
Ethyl benzene	920(S)	15.3	9.1	10.1	8.4	5.0
P-xylene	530(S)	26.9	2.8	10.7	13	7.4
m-xylene		75.4	2.7	24.0	34.5	20
o-xylene		46.7	15.2	16.6	9.0	18.5
isopropyl-benzene	20(PG)	-	122.6	2.2	-	-
Styrene	94(S)	2.6	77.5	132.2	0.5	4.6
n-propyl-benzene	-	5.3	0.6	21.2	2.9	9.7

TABLE 54

Monitoring Site Listing by Area

<u>Area</u>	<u>1977</u>	<u>1978</u>
Downtown Sarnia	8, 9, 10, 17, 48, 58, 130, 147	1, 2, 15, 32, 33, 42, 43, 49
Vidal St. North	5, 7, 27, 31, 35, 36, 37, 43, 101, 104, 105, 117, 120	6, 24, 26, 28, 29, 31, 53A
Vidal St. Center	1, 3, 4, 22, 30, 33, 102, 107, 108, 109, 110, 112, 113, 114, 115, 122, 124, 155	4, 7, 8, 10, 18, 21, 22, 27, 34, 36, 38, 40, 46, 47, 51, 52
Vidal St. South	12, 13, 14, 15, 28, 29, 40, 41, 42, 49, 50, 52, 55, 56, 121, 123, 134, 135, 136, 141, 146, 156	9, 12, 13, 14, 19, 23, 25, 35
Corunna	18, 20, 21, 23, 24, 46, 47, 53, 54, 64, 118, 133, 139, 142, 143, 158, 159	3, 16, 17, 20, 41, 44
Courtright	59, 60, 61, 125, 145, 148, 150, 151, 152, 153, 154	
Petrolia	128, 129, 131	

07. DISCUSSION

From April 20th to June 3rd, 1977, the weather in southwest Ontario was essentially under the influence of weak anticyclonic flows. Because of this, subsidence, nocturnal inversions and stratiform atmospheric conditions prevailed. No strong pressure centres were present and only four or five weak, slow moving frontal systems moved through this area (May 5, 8, 13 and 19th). The weather was generally sluggish, warm and dry (temperatures were approximately 4°C above the 30-year mean). Anticyclonic flow inferred long-range mass transport originated from the north west.

The diurnal variation of solar radiation gave rise to significant ground level dispersion via convection (fair weather cumulus were often observed) and the "lake breeze" effect (Lake Huron) was prevalent. The terrain in the area was essentially void of any large geographical structures, however channelling along the north/south direction was imposed by the St. Clair River. Because of these conditions, significant northerly winds and good dispersion conditions were often observed during the afternoons.

During the period October 11th to November 3rd, 1978, the weather in southwest Ontario was relatively active with 7 frontal systems moving through the area. Little precipitation resulted, however, and monitoring was rarely interrupted by weather conditions. The wind direction usually had a large north (30% of periods) or south (60% of periods) component, so that several suspected sources would be aligned when monitoring occurred downwind.

As mentioned in the INTRODUCTION, specific source identification was a major problem during the surveys. The DISCUSSION section will acknowledge this difficulty by emphasizing the air quality of an area rather than implicating certain sources as the sole contributor of various particular contaminants.

SARNIA:

Sulphur dioxide:

The sulphur dioxide Criterion was not exceeded during the downtown Sarnia monitoring periods for either survey.

In the 1977 survey, 8 monitoring periods (M.P.) had downtown Sarnia locations. For westerly winds the SO₂ mean concentration for each period was approximately 0.01 ppm, and a maximum 1-hour average concentration (MAC) near 0.015 ppm was found for one of the periods (#9). For the M.P. when southerly winds were present (#58), a larger maximum 1-hour average concentration was measured (0.027 ppm) and an instantaneous concentration of 0.174 ppm was detected.

In the 1978 survey, each of the downtown Sarnia monitoring locations experienced southerly winds during their periods of measurement. The maximum 1-hour average concentration was 0.15 (M.P. #32) and an instantaneous concentration of 0.24 ppm was recorded during the same period.

The mean 1-hour MAC for the 6 monitoring periods was 0.06 ppm SO₂. The 2 M.P.'s in Pt. Edward (#1, #2) had 1-hour MAC's of 0.096 and 0.093 ppm during southerly winds.

Total Reduced Sulphur:

In 1977, the monitoring periods in downtown Sarnia revealed relatively low amounts of TRS, achieving a maximum 1-hour average concentration of 0.017 ppm H₂S (less than the Criterion). This maximum occurred in M.P. #58 at the west end of Devine Street during a time period when the wind direction was southerly (see conc. plot #58). The maximum instantaneous concentration during that period was 0.089 ppm. The mean MAC for the 8 M.P.'s was 0.006 ppm.

In 1978, the maximum 1-hour average concentration of TRS detected in the downtown Sarnia area was 0.009 ppm (M.P. #32) and coincided with SSW winds. The mean MAC for the 6 monitoring periods was 0.004 ppm and the maximum instantaneous

concentration was 0.021 ppm (M.P. #49). For the 2 M.P.'s in the Pt. Edward area (#1, #2) the concentration of TRS was very low, reaching a maximum instantaneous concentration of 0.004 ppm.

Nitrogen Dioxide:

The 1-hour Criterion of 0.20 ppm NO₂ was not exceeded in the downtown Sarnia area during the 1977 survey. The mean 1-hour MAC for the 7 M.P.'s was 0.08 ppm, with the largest MAC being 0.13 ppm (M.P. #10) during a period of westerly winds.

For the 6 M.P.'s when NO₂ was monitored in downtown Sarnia during the 1978 survey, the 1-hour Criterion was not exceeded. The mean 1-hour MAC was 0.05 ppm and the largest MAC was 0.076 ppm (M.P. #33). For the Pt. Edward area the largest 1-hour MAC was 0.055 ppm NO₂ (M.P. #1 during southerly winds).

Ozone:

In the 1977 survey, ozone concentrations during the monitoring periods in the downtown Sarnia area were always less than the 1-hour Criterion of 0.08 ppm. The largest 1-hour average concentration for westerly winds was 0.053 ppm (M.P. #8), whereas southwesterly winds achieved a 1-hour MAC of 0.048 ppm (M.P. #58).

During the 1978 survey, ozone concentrations were relatively low in the downtown Sarnia area with the largest 1-hour MAC being 0.039 ppm. This occurred during the southerly winds of M.P. #33. Two M.P.'s in the Pt. Edward area had 1-hour MAC's of 0.028 and 0.036 ppm, again during southerly winds.

Total Hydrocarbons:

No Criteria for desirable ambient air quality have been established for total hydrocarbons due to the wide range of effects associated with different hydrocarbons at various concentrations.

For the 6 M.P. when THC were monitored in downtown Sarnia in 1977, the average of the monitoring period mean concentrations was 2.3 ppm. The largest 1-hour MAC was 5.1 ppm (M.P. #58), and the largest instantaneous value recorded was 35.7 ppm (M.P. #17). Emissions from vehicular traffic was the most probable source because of low wind velocity or westerly winds. M.P. #58 was an exception because of the wind conditions (SSW 12 km/hr) and because the SO₂ concentration attained a relative peak at the same time as the THC and NO_x peaks occurred. The presence of SO₂ points to refinery processes involving sulphur-bearing oil rather than the combustion of gasoline by vehicles.

For the 8 M.P. in downtown Sarnia and Point Edward in 1978 there was a strong southerly component to the wind direction. The largest 1-hour MAC of THC was 8.7 ppm (M.P. #43) and the largest instantaneous value was 19.4 ppm (M.P. #33). For all M.P., except #2, the SO₂ and THC concentrations achieved peak values simultaneously, pointing to chemical industries south of Sarnia rather than vehicular emissions.

From the Ministry of Environment 1978 annual report on ambient air quality in the Sarnia area it was noted that the annual average concentrations of THC were 2.6 ppm in a heavily travelled downtown area and 1.7 ppm in a lightly travelled downtown area. In addition, the 1977 annual report showed a THC pollution rose for the heavily travelled downtown area which displayed essentially equal (2.0 - 2.5 ppm) concentrations for most directions, with slightly higher values from the south and south-south-west. A THC background concentration of 2.0 to 2.5 ppm can be inferred from the above results, thereby providing some confidence in distinguishing the direct refinery contributions from the background levels.

VIDAL STREET:

Sulphur dioxide:

There are several sources of SO₂ in the Vidal Street area which combined

during 7 M.P. of the 1977 survey to produce concentrations greater than the Ontario 1-hour Criterion of 0.25 ppm. The 7 M.P. (#31, 49, 50, 52, 56, 122, 146) included more than 27 hours in excess of the Criterion, with the largest 1-hour MAC recorded being 1.10 ppm during M.P. #49 on May 25. The Transmode MAM unit was located on Sunoco Drive, adjacent to and downwind from the Sunoco refinery, during M.P. #49, 50, 52 and 56 (the Ford MAM unit for M.P. #146); however, the location for those periods was also downwind from most of the possible sources along Vidal Street. The Ford MAM unit was upwind of the Sunoco refinery during part of the high concentration interval (M.P. #136, 141) on May 25th and further downwind than the Transmode MAM unit during another part of the high concentration interval (M.P. #137, 139). The low SO₂ concentrations detected by the Ford MAM unit during these M.P.'s indicated that the source was probably localized and at low height near the Transmode MAM unit, thereby implicating the Sunoco refinery as the most probable source.

During M.P. #31 on May 16, 1977, the Transmode MAM unit was located at Chippewa and Rose Streets, approximately 0.8 km north of the stack cluster owned by Imperial Oil. The winds were variable (5 to 20 km/hr) and essentially from the south. The concentration/time plot (Appendix) showed considerable variation in the GLC of SO₂ and a gradual decrease in barometric pressure. The maximum 1-hour average GLC of SO₂ was 0.46 ppm - almost twice the Criterion. The leading edge effects of a low pressure area were being felt in the Sarnia area at this time and accounted, in part, for the elevated GLC of SO₂.

For M.P. #122 on May 12th, the Ford MAM unit was monitoring on Scott Road, 1.0 km south of St. Andrew Street. As shown in the concentration/time plot (Appendix), the concentrations of SO₂, NO₂ and THC increased abruptly and simultaneously to reach relatively high values for approximately 3 hours. The 1-hour MAC for SO₂ was 0.96 ppm and the maximum instantaneous concentration was 1.71 ppm. The winds were from due west at approximately 17 km/hr and therefore passed through

the area containing power boiler stacks for Imperial Oil and for Polysar and the flare stacks for waste and excess gas disposal (Imperial Oil).

For the 31 monitoring periods in the Vidal Street area during the 1978 survey, the one-hour average concentration did not exceed the Criterion of 0.25 ppm SO₂ at any time. The largest one-hour MAC in the Vidal Street area was 0.15 ppm (M.P. #35) and the largest instantaneous value was 0.35 ppm (M.P. #19); in each case the MAM unit was at the northern boundary of the Sunoco refinery during the periods of southerly winds at 12 km/hr.

Total Reduced Sulphur:

In the 1977 survey, 13 of the 53 monitoring periods in the Vidal Street area detected TRS average concentrations greater than the Ontario one-hour Criterion of 0.020 ppm H₂S. The Criterion was exceeded for a total elapsed time of 47 hours during the survey. As happened for SO₂, the largest one-hour MAC was recorded during M.P. #49 when a value of 0.170 ppm H₂S was reached. The maximum instantaneous value for M.P. #49 was 0.482 ppm, and the maximum instantaneous value for the entire survey was 0.512 ppm (M.P. #108). During the periods of high TRS concentration on May 25th and 26th (M.P.'s #49,52) simultaneous monitoring by the Ford MAM unit (M.P.'s #138, 141) indicated that the Sunoco refinery was probably a major contributor to the TRS levels.

For the 1978 survey, 2 of the 31 monitoring periods in the Vidal Street area detected TRS one-hour average concentrations greater than 0.020 ppm H₂S. M.P. #18 (0.040 ppm) and M.P. #36 (0.030 ppm) were both located on Huron Blvd. near Tashmoo Avenue when the Ontario Criterion was exceeded. The concentration/time plots for those periods show that the wind direction was NE for M.P. #18 and NW for M.P. #36 when the high concentrations were detected. The meteorological data for M.P. #36 reveal that a cold frontal passage occurred simultaneously with the abrupt changes in pollutant concentrations (03:30 hours). The rapidly changing wind direction could have

created air parcels containing TRS contributions from at least three potential sources (Polysar, Imperial Oil, Cabot Carbon). The large amount of vertical turbulence accompanying a cold frontal passage would also act to force the plumes down to ground level relatively close to the source locations and result in large ground level concentrations of TRS.

Nitrogen dioxide:

For the 1977 survey the NO_2 concentration exceeded the 1-hour Criterion of 0.20 only during M.P. #122 on May 12. The NO_2 criterion was exceeded during 2 separate intervals at the Scott Road location for a total of approximately 7 hours.

For westerly winds around 21:00 hours on May 12 a 1-hour MAC of 0.48 ppm was detected. For the northwesterly winds at 07:00 hours the following morning the hourly average had reached a value of 0.37 ppm. Wind data and other meteorological information for those intervals can be seen on the concentration/time plots for M.P.'s #28 and #29. As mentioned for SO_2 , the westerly winds had passed through an area containing power boiler stacks for Imperial Oil and for Polysar. The northwesterly winds probably carried emissions from the industrialized northern section of Vidal Street.

For the 44 M.P.'s during which NO_2 was monitored for more than one hour the arithmetic mean of the MAC's was determined to be 0.034 ppm NO_2 .

During the 1978 survey there were 28 M.P.'s during which NO_2 was monitored for more than one hour. The arithmetic mean of the 28 MAC's was determined to be 0.034 ppm NO_2 .

The largest one-hour MAC was 0.059 ppm (M.P.'s 7, 38), well under the Ontario Criterion of 0.20 ppm. It was observed that the M.P.'s with higher concentrations could be linked by the wind information to either vehicular emissions or one of several petrochemical complexes along Vidal Street.

Ozone:

In the 1977 survey ozone was monitored for more than one hour during 25 M.P.'s, resulting in an arithmetic mean of 25 one-hour MAC's of 0.046 ppm O_3 . The one-hour Ontario criterion of 0.08 ppm was exceeded during two M.P. only (#33, 0.14 ppm; #35, 0.12 ppm) and occurred on the day (May 17) when the maximum temperature for the month was reached ($31^{\circ}C$). The sites for M.P. #'s 33 and 35 were in the northern section of Vidal Street and the monitoring was carried out during periods of moderate SSW winds (10-16 km/hr). The site location is less important than the temperature and wind direction since it is known that high ozone concentrations in southern Ontario occur more frequently during periods of high temperatures or south/southwest winds.

For the 1978 survey period the one-hour Ontario criterion of 0.08 ppm O_3 was not exceeded at any time; the largest MAC was 0.065 pm (M.P. #53 A), again during southerly winds. The arithmetic mean of the MAC's for the 28 monitoring periods was 0.028 ppm.

CORUNNA:

Sulphur dioxide:

The one-hour Ontario Criterion of 0.25 ppm SO_2 was not exceeded for the 17 M.P's conducted in the vicinity of Corunna during the 1977 survey. The largest MAC in that area occurred during M.P. #158 when a value of 0.22 ppm SO_2 was recorded. The wind direction was NNW for that period and was generally N or NW as well for the other M.P.'s with higher SO_2 concentrations (M.P. #18, 47, 54, 142, 159).

Instantaneous concentrations greater than 0.25 ppm SO_2 were detected during several M.P.'s with the largest being 0.68 ppm (M.P. #23). The arithmetic mean of the 17 MAC's was 0.09 ppm SO_2 .

The one-hour Ontario criterion for SO_2 was not exceeded during the 5

M.P.'s of the 1978 survey. The largest MAC occurred during M.P. #17 near Hwy #40B and Beckwith St.: a one-hour average concentration of 0.11 was detected during a period of NE winds at 8 km/hr. The MAC of SO_2 was less than 0.01 ppm for each of the other periods.

Total Reduced Sulphur:

For the 1977 survey in the Corunna area the TRS one-hour Ontario Criterion of 0.020 ppm H_2S was exceeded during 2 of the 12 monitoring periods for a total elapsed time of about 8 hours. M.P. #139 recorded a one-hour MAC of 0.037 ppm H_2S at the intersection of LaSalle Road and Hwy #40 (Vidal Street). The wind speed and direction when the TRS concentration peaked were approximately 7 km/hr and 035° , which implicates the many possible sources along Vidal Street. M.P. #143 occurred at the park along Hwy #40 adjacent to the entrance to the Ethyl Corporation. The one-hour MAC of 0.033 ppm H_2S was recorded there during a period with wind conditions of around 4 km/hr and 010° . This air mass passed over part of the Shell Oil refinery and the Vidal Street conglomeration of possible sources. The largest instantaneous concentration of TRS in the vicinity of Corunna also occurred during M.P. #143 when 0.046 ppm H_2S was detected.

The arithmetic mean of the MAC's for the 12 M.P.'s was determined to be 0.011 ppm H_2S .

For the 5 M.P.'s in the Corunna area during the 1978 survey the largest MAC of TRS was 0.012 ppm H_2S . This occurred during M.P. #17, when the SO_2 peak concentration was obtained for N.E. winds of 8 km/hr. All other M.P.'s had TRS one-hour MAC's less than 0.004 ppm.

Nitrogen dioxide:

For the 18 M.P.'s during the 1977 survey when NO_2 was monitored, the

one-hour Ontario Criterion of 0.20 ppm was not exceeded. The largest MAC in the Corunna area was recorded during M.P. #46 when a concentration of 0.12 ppm was obtained. The average wind speed was zero throughout the monitoring period, so the possible influence of the NO_2 emissions from the MAM unit generators or the nearby vehicular traffic on Hwy #40 can not be disregarded. However, there were 7 other M.P.'s where the MAC reached a level of 0.08 ppm or greater; in addition, the arithmetic mean of the MAC's for the 18 monitoring periods was determined to be 0.065 ppm NO_2 .

The concentration of NO_2 was generally low for the 5 M.P.'s of the 1978 survey with the largest MAC being 0.055 ppm (M.P. #41). The average wind speed was zero for M.P. #41 during the interval of highest NO_2 concentration, which implicates the emissions from the MAM unit generators. The MAC's for the other four M.P.'s were less than 0.025 ppm.

Ozone:

Ground level concentrations of ozone were monitored during 10 M.P.'s in the Corunna area in the 1977 survey. The one-hour Ontario Criterion of 0.08 ppm was exceeded only during M.P. #54 for a period of approximately 2½ hours. A one-hour MAC of 0.15 ppm ozone was reached around 10:00 hours, which is unusual since the diurnal maximum normally occurs during mid-afternoon. Long range transport of ozone from the south/southwest was not indicated since the wind direction for the preceding 24-hour period was generally north/northwest. It is more probable that the rapidly increasing solar radiation and surface temperature caused a great increase in photochemical activity involving reactive hydrocarbons and oxides of nitrogen, a well-known source of ozone downwind of an urban industrialized area such as Sarnia-Port Huron.

The maximum instantaneous concentration of ozone during the entire 1977 survey period also occurred during M.P. #54 when a level of 0.17 ppm was detected. The arithmetic mean of the 10 MAC's was 0.05 ppm O_3 .

Ozone concentrations did not exceed the one-hour Ontario Criterion of 0.08 ppm in the Corunna area during the 1978 survey. The largest MAC of ozone occurred during M.P. #3, when a value of 0.043 ppm was recorded for a period of SW winds at 19 km/hr, indicating that long-range transport from the south/southwest was the most probable cause. The MAC's for the other four M.P.'s were in the range of 0.024 to 0.031 ppm.

THC:

The largest MAC of THC during the 1977 survey period in the Corunna area was 8.4 ppm (M.P. #18) for northerly winds. The maximum instantaneous concentration for the Corunna area was 26.9 ppm for M.P. #118 at Hwy #40 and La Salle Road; however the winds were light and south/southeast on that occasion. The arithmetic mean of the 18 MAC's was 3.7 ppm.

For the 5 M.P.'s in the Corunna area during the 1978 survey the largest one-hour average concentration of THC occurred in M.P. #41 while the wind speed was zero, which implicates the MAM unit generators as the most probable source. The one-hour MAC for that period was 5.3 ppm. For M.P. #17, when the SO₂ and TRS maximum concentrations were recorded, the one-hour MAC of total hydrocarbons was 4.1 ppm; this occurred near Hwy #40 and Beckwith St. during a period of NE winds at 8 km/hr. The arithmetic mean of the one-hour MAC's for the 5 M.P.'s was 4.0 ppm.

COURTRIGHT:

Sulphur dioxide:

Ambient air quality in the Courtright area was monitored only during the 1977 survey period (not 1978). For the 9 M.P.'s in that area the arithmetic mean of the MAC's was 0.05 ppm. Generally westerly winds were experienced at each of the monitoring sites, except for M.P. #125, indicating that the Ontario Hydro Lambton

Generating Station was the most probable source of SO_2 for those M.P.'s with little contribution from the Vidal St. area of Sarnia. M.P. #125 recorded a 1-hour average SO_2 concentration of 0.14 ppm during a period of SW winds while located 5 km east of the Ontario Hydro Lambton Generating Station. The monitoring location and the wind direction indicate that the Detroit Edison St. Clair Generating Station located 4 km south of the Lambton Station was the most probable source of SO_2 for M.P. #125. The maximum instantaneous concentration for the 9 M.P.'s was 0.55 ppm (M.P. #59).

Total Reduced Sulphur:

Only 3 of the 9 M.P.'s recorded one-hour average concentrations of TRS greater than 0.002 ppm. The largest one-hour MAC was 0.02 ppm, equal to the Ontario air quality Criterion. For that monitoring period (M.P. #145) the Ford MAM unit was located adjacent to the Ontario Hydro Lambton Generating Station. An instantaneous concentration of 0.051 ppm was recorded for that period as well.

Nitrogen dioxide:

The one-hour Ontario Criterion of 0.20 ppm NO_2 was not exceeded for the 9 M.P.'s in the Courtright area. The largest MAC was 0.16 ppm, recorded during M.P. #145 adjacent to the Lambton Generating Station. The maximum instantaneous concentration of 0.39 ppm also occurred during M.P. #145. The arithmetic mean one-hour MAC for the 9 M.P.'s was 0.04 ppm NO_2 .

Ozone:

The one-hour average concentration of ozone did not exceed 0.046 ppm for the 3 M.P.'s by the Transmode MAM unit. Each of those monitoring periods occurred within a 17-hour interval starting on June 1st, but this limited amount of information is supplemented by the ozone data for all other M.P.'s during the 1977 survey since there are no known local sources of ozone and long range transport is the most probable source

during that interval, when SW winds prevailed.

THC:

The one-hour average concentrations of total hydrocarbons were quite low (2 ppm) for all M.P.'s except M.P. #145 when a value of 18 ppm was recorded adjacent to Hwy #40 and the Lambton Generating Station at approximately 18:00 hours on May 30. Simultaneous measurements gave low SO₂ concentrations, while TRS and NO₂ reached peak concentrations at significant levels; however, these facts do not preclude the possibility that a large volume of vehicular traffic was the source of elevated THC concentrations.

PETROLIA:

The 3 monitoring periods (#128, 129, 131) in the Petrolia area recorded negligible concentrations of SO₂. Two of the M.P.'s had one-hour MAC's of TRS in excess of the Ontario Criterion of 0.02 ppm; a one-hour average of 0.071 ppm (M.P. #131) was detected around mid-day on May 19th. The Ford MAM unit was located at Centre St. and Blind Line, downwind from nearby oil wells under conditions of very light winds. M.P. #128 recorded a one-hour average of 0.021 ppm H₂S at Eureka Street and Blind Line on May 18th. The wind was from the southwest at 10 km/hr for that period and passed over a nearby creek suspected of being a source of H₂S. During the other monitoring period (#129) THC reached a level of 11 ppm near an oil well in the Eureka St. - Blind Line area; THC was negligible for M.P.'s #128 and 131.

VINYL CHLORIDE MONOMER (VCM) - North Vidal

It will be noted from the gas chromatograph (G.C.) data summary tables (Table #'s 33-40) that two areas in the vicinity of the Imperial Oil complex were monitored for VCM emissions. These were the Esso Chemical Polyvinyl Chloride (PVC)

plant on the east side of Vidal Street and the main refinery complex on the west side of Vidal Street.

During 6 monitoring days, thirty-one 30-minute ambient air samples were collected in the vicinity of the PVC plant. Twenty-nine of these samples contained VCM ambient air concentrations below the detection limit as set by the G.C. (i.e., below 0.005 ppm).

On the morning of May 5th, GLC's of VCM in the range of 4 to 6.6 ppm (20 to 30 times the Guideline) were detected. These results were obtained from 2 ambient air samples collected downwind of the PVC plant (Sites B and C on Map #9). These results were later confirmed by analyses carried out by the Laboratory Services Branch of the Ministry of the Environment. Through communications with Esso Chemical, service maintenance error at the PVC plant was the suspected cause of the elevated concentrations of VCM.

In addition to these 31 samples, cooperative sampling and analysis with Esso Chemical were undertaken on 2 occasions on May 11th. The MOE - G.C. analysis showed only trace amounts (roughly the detection limit, 0.005 ppm) of VCM, whereas the Esso Chemical results were more than twice that level. Esso Chemical reported that their analytical instrument routinely gave higher VCM readings than those reported by the MOE instrument.

During three other monitoring days, sixteen 30-minute ambient air samples were collected in the vicinity of the main refinery complex on the west side of Vidal Street. No VCM was detected in any of these samples.

Under calm weather conditions, an additional 7 ambient air samples were gathered along Vidal Street and in the vicinity of the PVC plant. Under these poorer dispersion conditions, significant GLC's of VCM were detected. One of these samples resulted in VCM concentrations in excess of the Guideline. The highest GLC of VCM was 1.0 ppm and was detected at the railway tracks near Kenny and Vidal Streets during the morning of April 27.

VINYL CHLORIDE MONOMER (VCM): South Vidal

Dow Chemical supplies VCM to the Esso Chemical PVC plant located on the east side of Vidal Street. Owing to the former being a probable source of VCM, an ambient air sampling programme for VCM was carried out. Twenty-one 30-minute grab bag samples were collected in the vicinity of the Dow Chemical VCM plant and were subsequently analyzed for VCM by the gas chromatograph.

VCM was detected in only one of these samples. Its reported value was 0.04 ppm (approximately 1/5 of the 30-minute Guideline). This sample was taken at the first intersection on the road to Dow Chemical (position R on Map #9) and downwind of Dow Chemical.

ETHYLENE (C_2H_4) AND OTHER HYDROCARBONS: North Vidal

From the same ambient air samples as those used for VCM GLC determinations, GLC's of ethylene and other higher order hydrocarbons were determined by the G.C.

Of the 33 samples taken in the vicinity of the PVC plant, 23 samples showed GLC's of C_2H_4 . The mean concentration of C_2H_4 as reported from these samples was 0.8 ppm (Reference to G.C. data summary Tables #33-37). A considerable variation in ambient air concentrations of C_2H_4 was detected in this area. Twelve of the 33 samples had concentrations in excess of the Tentative Design Standard.

The maximum GLC's of C_2H_4 were detected on May 6th along Kenny Road, downwind of the PVC and ethylene plants owned by Imperial Oil. The largest reported GLC of C_2H_4 was 2.7 ppm (approximately 20 times the Tentative Design Standard). This value was recorded during a cold frontal passage in this area (see preliminary discussion) under strong veering winds (approximately 15 to 20 km/hr and west to northerly directions) with an abrupt increase in barometric pressure (reference to concentration/time graphs for M.P. #12 and #14).

In addition, ambient air concentrations of C_2H_6 and C_3H_8 were also detected in 6 and 3 samples, respectively, of the total 33 samples. The maximum GLC

of C_2H_6 was 0.34 ppm and was detected on May 6th under the same meteorological/sampling conditions as those reported for the high C_2H_4 concentrations. The maximum GLC of C_3H_8 was 1.2 ppm and again this value was reported during this same sampling period on May 6th.

As a note of interest, no appreciable increase in GLC's of C_2H_4 , C_2H_6 or C_3H_8 were detected during the high VCM readings on May 5th.

With respect to the G.C. sampling programme carried out in the vicinity of the main refinery complex on the west side of North Vidal Street, 13 of the 16 ambient air samples contained measurable ethylene concentrations. The mean GLC of C_2H_4 was 1.4 ppm (i.e., - 10 times the Tentative Design Standard and approximately double the reported mean GLC of C_2H_4 as detected on the east side of Vidal Street near the PVC plant). Eight of these 16 samples resulted in GLC's of C_2H_4 in excess of the Standard.

The maximum GLC of C_2H_4 was approximately 4 ppm (approximately 30 times the Tentative Standard) and was reported on May 18th. This sample was taken near the Imperial Oil Stack cluster at Clifford and Vidal Streets (See Map #9, Site E). As mentioned in the SO_2 discussion, the area was in a low pressure region at this time which directly influenced this elevated GLC of C_2H_4 .

In addition, other higher ordered hydrocarbons were detected in these 16 samples.

Ten of these 16 samples resulted in elevated concentrations of C_2H_6 . The mean GLC of C_2H_6 was 0.41 ppm and the maximum GLC of C_2H_6 was 1.34 ppm. This high value was detected on May 18 from the same sample as the maximum GLC of C_2H_4 .

Seven of the 16 samples reported GLC's of C_3H_6 . The mean GLC of C_3H_6 was 0.43 ppm and the maximum GLC was 1.29 ppm. Again this elevated concentration was detected on May 18th and the sample was the same as that which was reported for the high C_2H_4 GLC.

Finally, five of the 16 samples contained GLC's of C_3H_8 . The mean GLC of C_3H_8 for these reported values was 0.55 ppm and the maximum GLC was 1.2 ppm.

This maximum GLC of C_3H_8 was recorded on May 6 and the sample was taken along Vidal Street, north of Imperial Road (Map #9, Site D). As mentioned earlier, Sarnia was under the influence of a low pressure area during this monitoring period. (Again noting concentration/time graphs for M.P. #12 and #14).

In concluding this discussion of ethylene and other higher order hydrocarbon concentrations detected in the vicinity of the Imperial Oil complex, the seven reported samples taken on April 22 and 27 under calm weather conditions also showed significant GLC's of hydrocarbons. The mean ground level concentrations of C_2H_4 , C_2H_6 , C_3H_6 and C_3H_8 were 1.4 ppm, 0.8 ppm, 0.3 ppm and 0.9 ppm respectively. In addition, 3 of the 7 samples showed GLC's of C_4H_{10} . The mean GLC of C_4H_{10} for these three samples was 0.05 ppm. A quick examination of the G.C. data summary table for this period (Table #38) clearly showed the effects of poorer dispersion conditions.

ETHYLENE (C_2H_4) AND OTHER HYDROCARBONS: South Vidal

From the ambient air samples collected in the vicinity of the Dow VCM Plant, GLC's of ethylene and other higher ordered hydrocarbons were also determined by the G.C.

Of these 21 samples only 10 reported GLC's of C_2H_4 . From these samples, the mean GLC of C_2H_4 was 0.88 ppm. (Reference to G.C. data summary Tables #41, 42, 43)

Only 2 of these 21 samples contained ambient air GLC's of C_2H_4 in excess of the Tentative Standard. Both samples were taken during the morning of May 13th and the winds, as indicated by M.P. #13, were from the north at about 8 km/hour. The sample taken 120 m downwind from the Dow Chemical VCM plant (position O on Map #9) reported the highest GLC of C_2H_4 (a value of 4.74 ppm), but may have included emissions from potential ethylene sources at Polysar.

With respect to other hydrocarbons detected in these 21 samples, only 10 samples showed C_2H_6 , 5 samples contained measurable C_3H_6 and 3 samples had C_3H_8 .

From this data, the mean GLC's of C_2H_6 , C_3H_6 , and C_3H_8 were 0.97 ppm, 0.52 ppm and 0.37 ppm, respectively. These samples were acquired under essentially calm weather conditions (wind speed 10 km/hr) on May 12, 13 and 18th and very close to the Dow Chemical VCM plant (positions O, P, Q and R as indicated on Map #9).

Ten 30-minute ambient air samples were gathered during May 20th and 25th in the vicinity of the Sunoco refinery and were subsequently analyzed for hydrocarbons by the G.C. A summary of these results is presented in Table #44, and the locations of the sampling sites are shown on Map #9.

Ethylene was detected in only 4 of the samples and the mean GLC of C_2H_4 from these samples was found to be 0.30 ppm (i.e., twice the 30-minute Tentative Design Standard) with associated standard deviation 0.005 ppm. Thus elevated and essentially uniform ambient air concentrations of ethylene were detected in the vicinity of this refinery.

The maximum GLC of C_2H_4 was detected around 1800 hours on May 25th and its reported value was 0.35 ppm. This sample was taken along Sunoco Drive, approximately 180 m east of Hwy #40B and downwind of the Sunoco refinery; M.P. #53 indicated the winds were from the north at approximately 30 km/hr during this sampling period, which suggests Dow, Imperial and Polysar as possible sources as well.

With respect to the other higher ordered hydrocarbons as analyzed/detected from these 10 samples by the G.C., C_2H_6 was found to be present in only one sample and C_3H_6 was found in only one other sample. Both samples were taken downwind of the Sunoco refinery on May 25th. The reported GLC's were 0.17 ppm for C_2H_6 and 0.45 ppm for C_3H_6 .

ETHYLENE (C_2H_4) AND OTHER HYDROCARBONS - Corunna:

As stated earlier, Dupont was a suspected sources of ethylene. Owing to this assumption, thirteen 30-minute ambient air samples were gathered on two separate

days in the vicinity of this plant and subsequently analyzed for C_2H_4 and other hydrocarbons by the gas chromatograph. The sampling locations and analyses are presented on Map #10 and in the Summary Tables #45, 46. In summary, very little ethylene (mean GLC was 0.08 ppm) and no higher ordered hydrocarbons were detected in these samples.

BACKGROUND - 1977:

Supplementing the ambitious G.C. analyses carried out for vinyl chloride monomer (VCM), ethylene (C_2H_4) and other higher ordered hydrocarbons in the industrial complex of Sarnia, four 30-minute ambient air samples were accumulated on April 27th in order to determine concentration levels in other areas surrounding the industrial complex. A description/summary of these samples is given in Table #47.

Two of the samples were taken in the commercial/residential area of downtown Sarnia. A considerable amount of C_2H_4 and C_2H_6 were detected (0.35 ppm for C_2H_4 - 2½ times the Tentative Design Standard, and 0.09 ppm for C_2H_6). No VCM was detected.

The wind conditions were southerly at 20 km/hr for the sampling periods on April 27th, so the possible influence on background in downtown Sarnia by emissions from the Vidal St. industrial area cannot be disregarded since the C_2H_4 concentrations were 6 to 10 times the Tentative Design Standard along Vidal St. on that day.

In order to sample "clean air", the remaining two samples were taken approximately 10 miles east of Sarnia (adjacent to, but upwind of Hwy#7 traffic) . Nevertheless, 0.2 ppm of C_2H_4 and 0.07 ppm of C_2H_6 were detected in these samples and once again, no VCM was found to be present.

If vehicle emissions were the source of hydrocarbons for the "clean air" samples, then that source exists in the Vidal St. area as well but could not, by itself, account for the high concentrations of C_2H_4 along Vidal St.

HYDROCARBONS: (1978)

The samples collected in the 1978 survey for hydrocarbon analysis by the gas chromatograph carried in the MAM unit represented 80 sampling periods of 30 minutes each. They were obtained during 19 monitoring periods of the MAM unit. Although the results must be compared to the 30-minute Ontario Standards for the various hydrocarbons in order to provide some indication of the ambient air quality, the discussion will not be source specific but will follow the style of the previous section whereby the air quality of an area is the prime concern. There were 5 general sampling areas as follows: Sarnia (southern boundary Confederation St.), North Vidal St. (Confederation St. to Kenny Rd.), Central Vidal St. (Kenny Rd. to Churchill Rd.), South Vidal St. (Churchill Rd. to LaSalle Rd.), Corunna (La Salle Rd. south through Corunna).

Sarnia:

The summary table (#53) of the results list the 14 hydrocarbons for which the gas chromatograph was calibrated. The mean values for the 15 sampling periods in the Sarnia area (all during M.P. #33) revealed no large concentrations of any of the hydrocarbon components.

North Vidal Street:

The largest pentane concentrations were found in this area with a maximum 30-minute average concentration of 0.87 ppm (M.P. #10) and a mean value of 0.09 ppm for the 14 sampling periods.

Benzene, toluene and total xylene each had mean concentrations around 0.04 ppm, and only exceeded 0.1 ppm on one occasion (Benzene, 0.11 ppm, M.P. #31).

The mean concentration of styrene was largest in this area (0.13 ppm), due mainly to the large concentrations during M.P. #31 downwind of the Imperial Oil main

refinery when some of the samples had concentrations of 0.46 ppm, 0.43 ppm, 0.30 ppm and 0.28 ppm, all in excess of the 30-minute point of impingement Standard (applicable when source is known) of 0.094 ppm.

Central Vidal Street:

The largest 30-minute average concentration of benzene (2.3 ppm), ethyl benzene (0.12 ppm) and styrene (0.77 ppm) occurred in this area during the same monitoring period (#22). The sample was collected adjacent to and downwind from the new Polysar styrene plant, where benzene and ethyl benzene are important components of the styrene manufacturing process. Omitting this sample period the mean concentrations were 0.07 ppm for benzene, 0.005 ppm for ethyl benzene and 0.05 ppm for styrene.

The largest of two isopropyl benzene (cumene) measurements occurred in this area. A concentration of 0.12 ppm was found during one sampling period of M.P. #27, coinciding with a zero result for 8 of the other 13 hydrocarbons, which casts some doubt on the isopropyl benzene result. The 30-minute point of impingement Standard is 0.02 ppm.

South Vidal Street:

This area contained the largest mean concentrations for 7 of the 14 hydrocarbons, including toluene, ethyl benzene and p-, m- and o-xylene. The results were dominated by the 13 samples taken during the overnight monitoring period #35 near the northern boundary of the Sunoco property; winds were southerly at 12 km/hr throughout the monitoring period.

Corunna:

There were only 3 samples taken in the Corunna area but one of them (during M.P. #16) showed significant levels of the various hydrocarbons except for styrene and isopropyl benzene; however, none of the hydrocarbons concentrations approached the 30-minute Ontario Standards. The sampling site was adjacent to and downwind from the Shell Canada refinery for M.P. #16.

CONCLUSIONS:

The ambient air concentrations of SO_2 , TRS, NO_2 , O_3 and THC in the downtown Sarnia area were generally low during the 1977 and 1978 survey periods. The Ontario one-hour air quality Criteria for those contaminants were not exceeded during the monitored periods, which usually experienced southerly winds. Brief monitoring in Point Edward in 1978 also detected low concentrations of the contaminants mentioned above.

Monitoring in the Vidal Street area revealed that from 1977 to 1978 a large reduction occurred in the number of excursions above the one-hour Criteria for SO_2 and TRS in particular, and for NO_2 and O_3 to a lesser extent. There was also a large reduction in the maximum concentration obtained for each contaminant. The reduction in THC from 1977 to 1978 was less marked.

Although the Corunna area experienced excursions above the Criteria only for TRS (twice) and for O_3 (once) during the 1977 survey the reduction in concentration was noticeable for all contaminants during the 1978 survey when none of the Criteria were exceeded.

Ambient air quality in the Courtright area was monitored only during the 1977 survey period and generally low concentrations were found for all of the above mentioned contaminants.

A brief period of monitoring for several contaminants in the Petrolia area during the 1977 survey detected significant concentrations of TRS and little else; the TRS Criterion of 0.02 ppm was exceeded for 2 of the 3 M.P.'s. Suspected sources were a nearby creek and oil wells.

Monitoring of vinyl chloride monomer (VCM) in the Vidal Street area revealed concentrations below the detection limit (0.005 ppm) in most cases. Samples taken downwind of the Esso Chemical polyvinyl chloride plant exceeded the Ontario 30-

minute Guideline (0.2 ppm) on 2 occasions, believed to be due to service maintenance error at the plant. Most samples taken during calm, poor dispersion conditions in the area of Vidal Street and the PVC plant showed VCM present, including one sample over the Guideline. Samples taken in the vicinity of the Imperial Oil main refinery complex on the west side of Vidal Street showed no detectable VCM. Samples taken in the vicinity of the Dow Chemical VCM plant contained detectable VCM in only 1 of the 21 samples.

Monitoring for ethylene and other low order olefin and paraffin hydrocarbons during the 1977 survey period revealed that the Tentative Design Standard for ethylene was frequently exceeded in many areas of Sarnia, sometimes by a factor of 20 or 30 in certain areas.

Hydrocarbons monitored during the 1978 survey included some higher order paraffins, benzene and some of the benzene derivatives (aromatic hydrocarbons). Of those hydrocarbons with established Standards only styrene was found, with some degree of confidence, to have exceeded the Standard. It seems likely that there were two separate and significant sources of styrene. The benzene Standard of 3 ppm was approached on only one occasion, when a concentration of 2.3 ppm was measured downwind of a styrene plant.

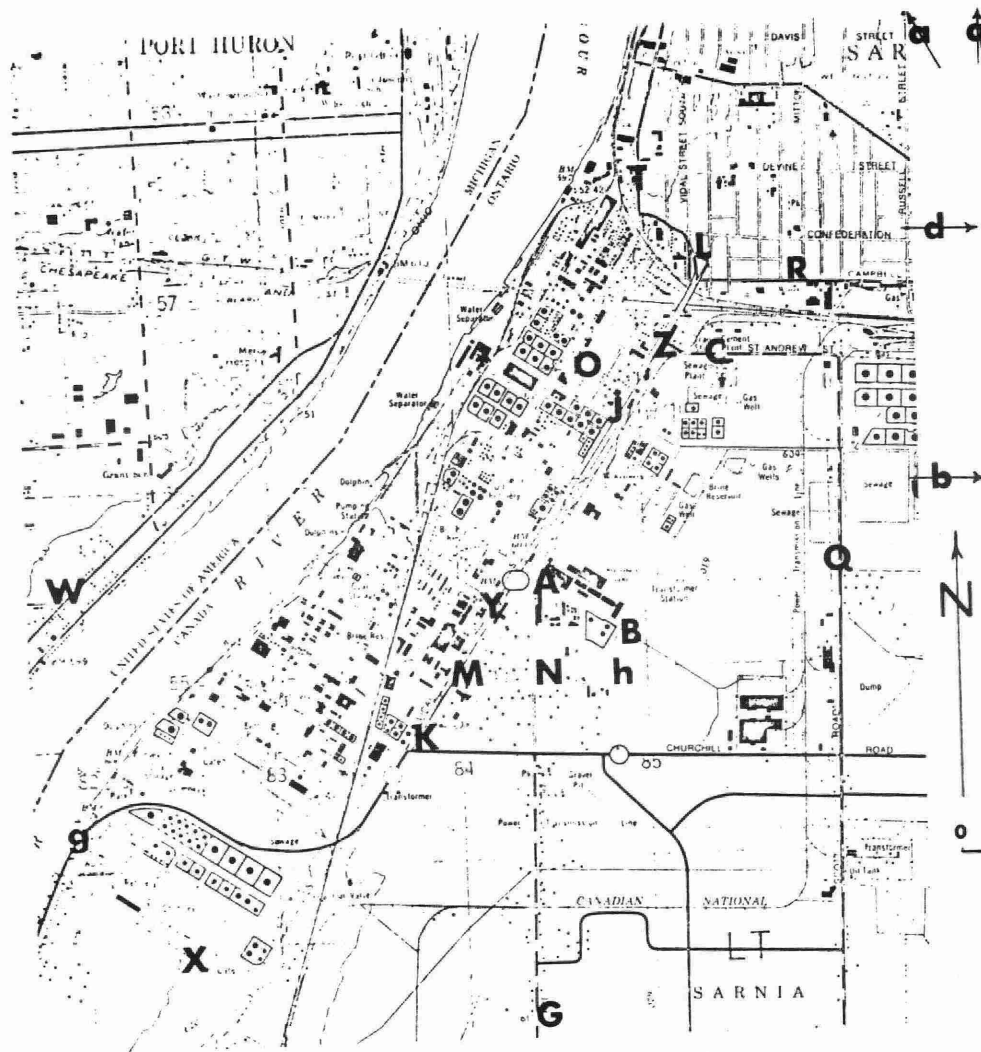
APPENDIX

A. MONITORING SITE LOCATIONS

The ambient air monitoring sites for the 1977 survey are shown on Maps #5, #6, #7 and #8 and their associated descriptions are presented in Tables 55-60. The monitoring sites are tabulated according to the MAM unit involved during the survey and they are presented in chronological order. Two digit monitoring period # refers to the GMC MAM unit, three digits refers to the Ford MAM unit.

In addition, sampling sites incorporated for the gas chromatographic work are presented in Maps #9 and #10 and their associated descriptions are presented in Tables 33-47.

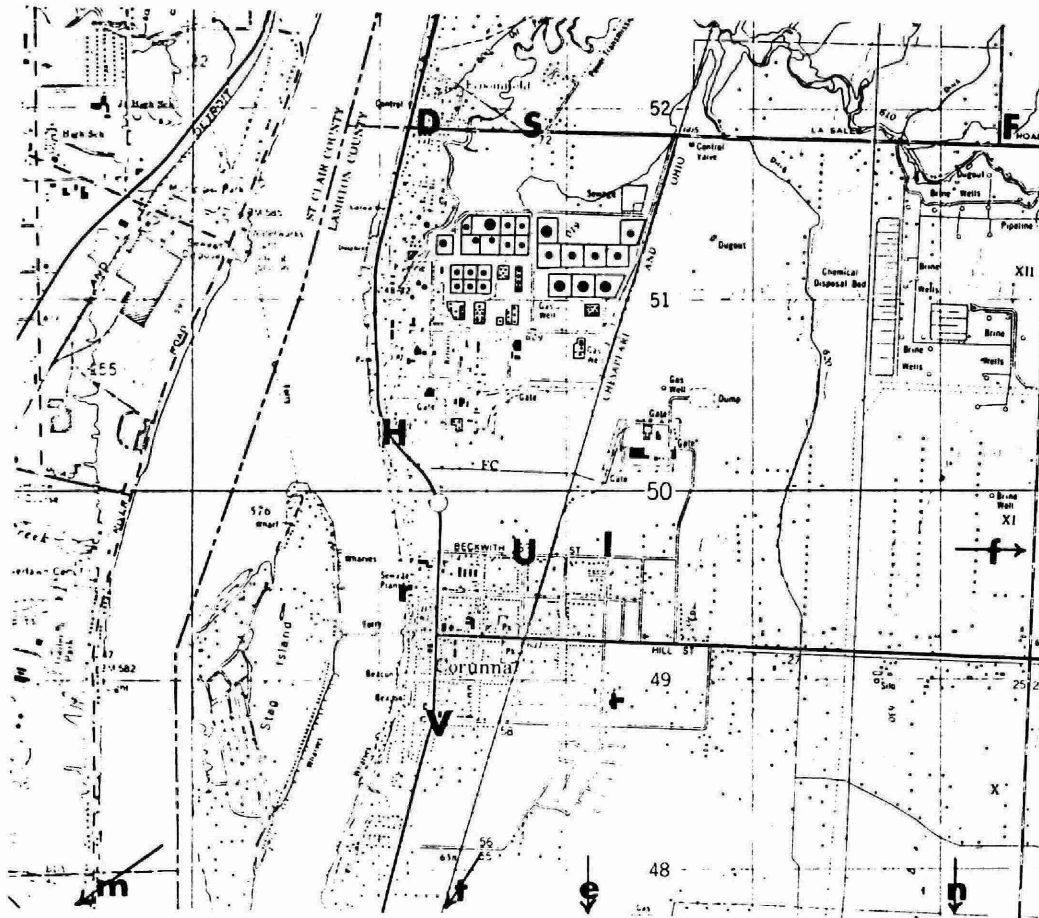
The ambient air monitoring sites for the 1978 survey are shown on Map #11 and the associated descriptions are listed in Tables 61-64. The gas chromatograph sample numbers listed in Tables 48 to 52 for the 1978 survey correspond to the monitoring period number as listed in Tables 61-64 and all samples were taken at the MAM unit location.



1977 SARNIA SURVEY
MONITORING SITES
(TRANSMODE)

MAP #5

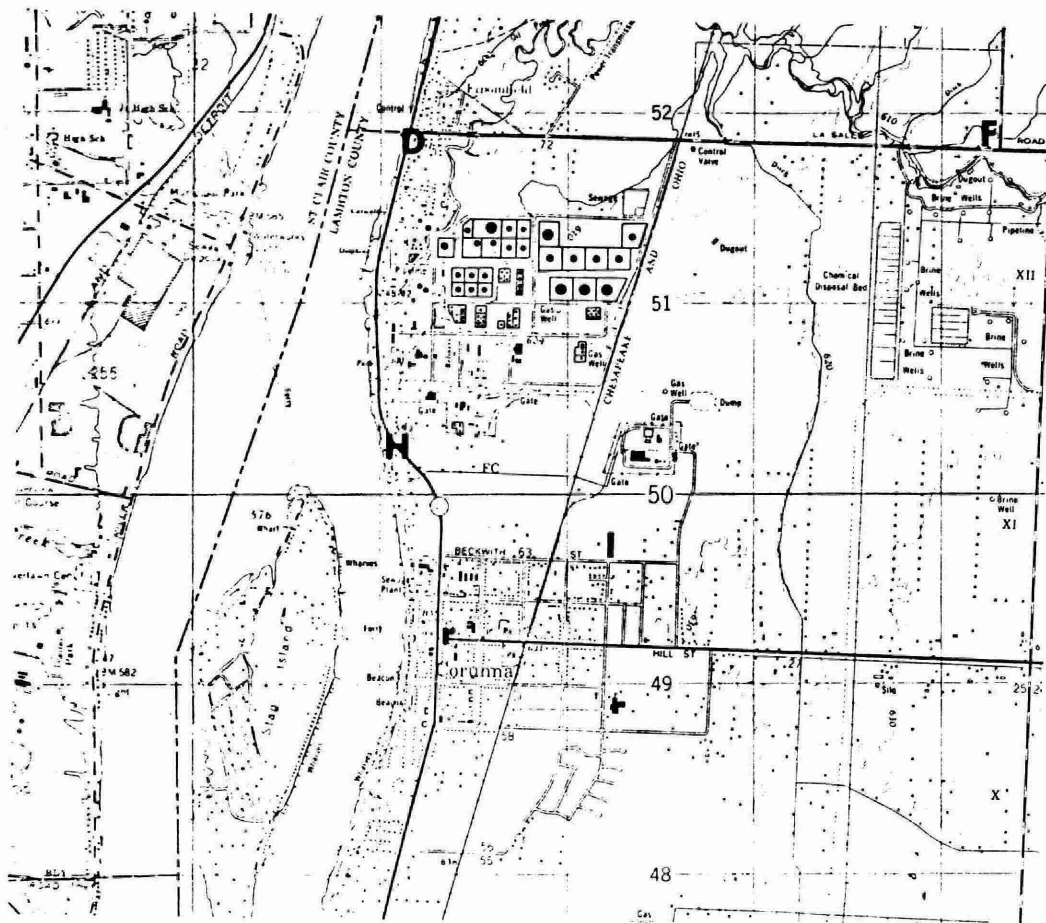




0 1 km

1977 SARNIA SURVEY
MONITORING SITES
(TRANSMODE)

MAP #6



1977 SARNIA SURVEY

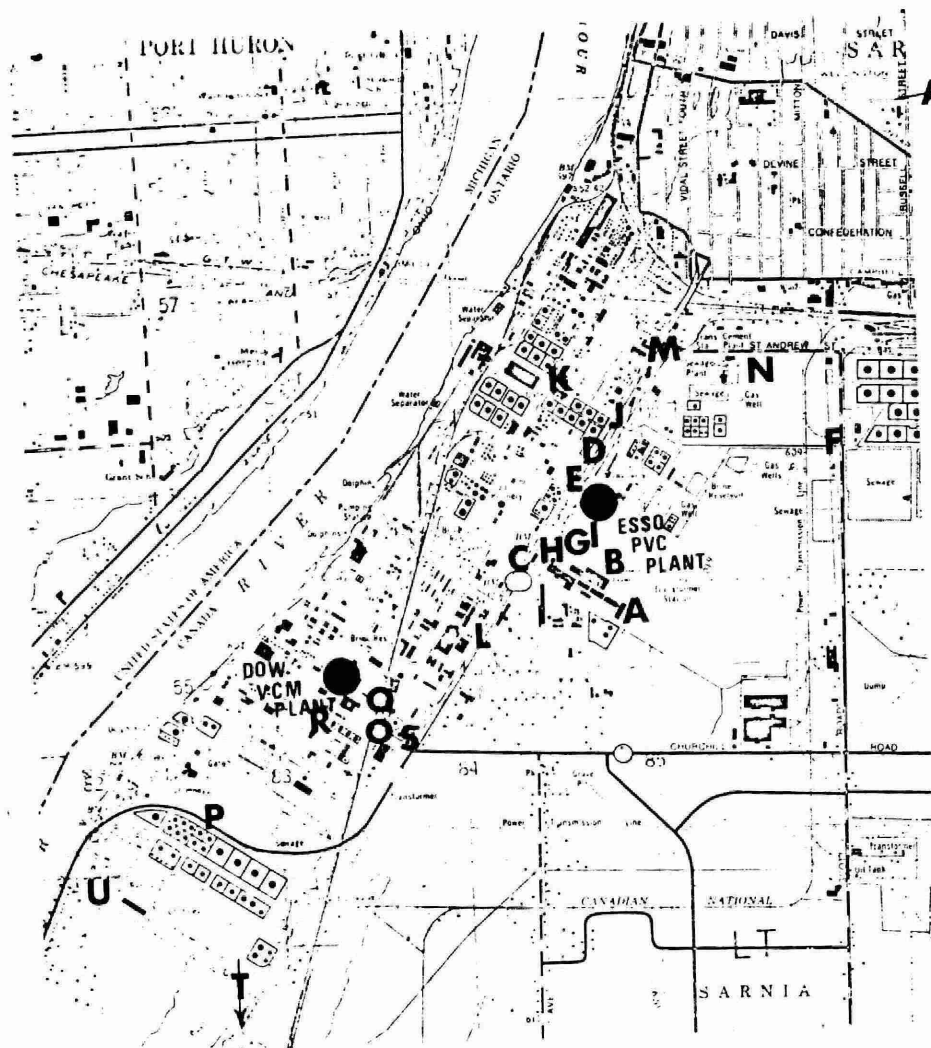
MONITORING SITES

(FORD)



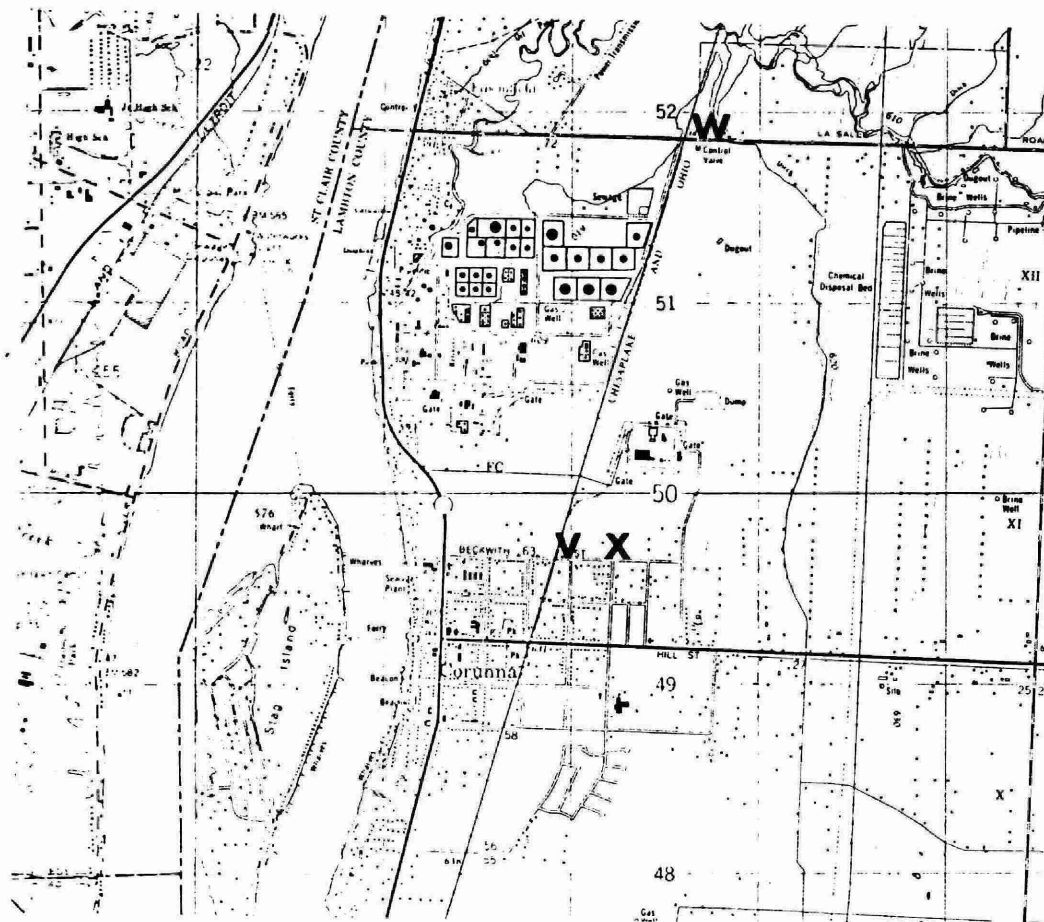
0 1 km

MAP #8



1977 SARNIA SURVEY
GAS CHROMATOGRAPH SITES

MAP #9

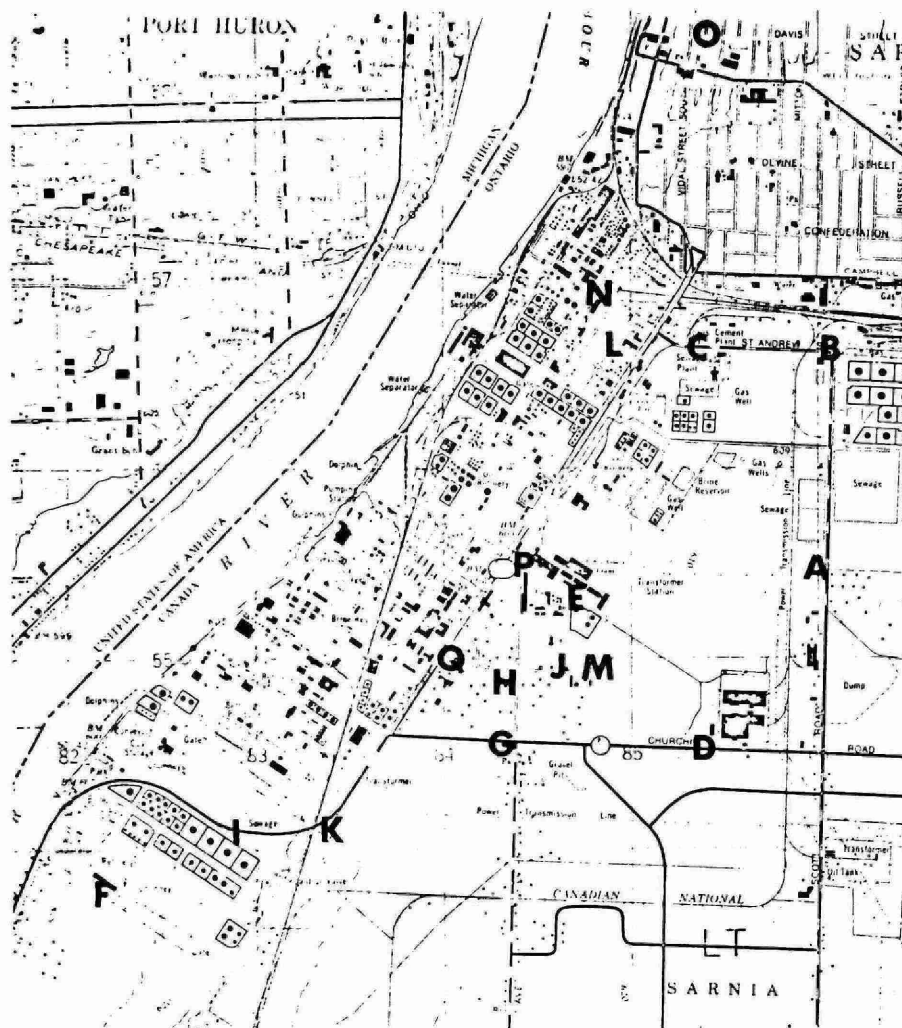


1977 SARNIA SURVEY
GAS CHROMATOGRAPH SITES



0 1 km

MAP #10



1978 SARNIA SURVEY
MONITORING SITES

MAP #11

TABLE 55

Mobile Air Monitoring Sites

All Monitoring Periods Were Logged As

Sarnia # X

<u>Monitoring Period #</u>	<u>Map I.D.</u>	<u>Location & U.T.M. Co-ordinates</u>	<u>Date</u>
1	A	Kenny Rd: 0.2 Km E. of Vidal St. (38440-47555)	Apr. 22/77
3	B	Kenny Rd. (38480-47552)	Apr. 26/77
4	B	Kenny Rd. (38480-47552)	Apr. 26/77
5	C	St. Andrew St. (Sewage Plant) (38540-47568)	Apr. 27/77
7	Z	St. Andrew St. & Vidal St. (38520-47567)	Apr. 27/77
8	*a	Chalet Motel (38569-47594)	May 5/77
9	*a	Chalet Motel (38569-47594)	May 5/77
10	*a	Chalet Motel (38569-47594)	May 5/77
12	E	Churchill Rd. & Tashmoo Ave. (38440-47545)	May 6/77
13	F	Lasalle Rd. & Tashmoo Ave. (38420-47518)	May 9/77
14	G	Tashmoo Ave., 1.3 Km N of Lasalle (38430-47530)	May 9/77
15	E	Tashmoo Ave., 0.1 Km S. of Churchill (38430-47544)	May 9/77
17	*a	Chalet Motel (38560-47594)	May 9/77
18	H	Hwy #50, N. of Corunna (38100-47502)	May 9/77

TABLE 56

<u>Monitoring Period #</u>	<u>Map I.D.</u>	<u>Location & U.T.M. Co-ordinates</u>	<u>Date</u>
20	I	Corunna; Beckwith & Colborne Sts. (38220-47497)	May 10/77
21	I	Corunna; Beckwith & Colborne Sts. (38220-47497)	May 10/77
22	M	Vidal St. & Huron Blvd. (38400-47550)	May 11/77
23	H	Hwy #40, N. of Corunna (38096-47505)	May 11/77
24	H	Hwy #40, N. of Corunna, (38096-4755)	May 12/77
25	*b	Indian Rd. (38770-47558)	May 12/77
27	J	Vidal & Clifford St. (38500-47565)	May 12/77
28	K	Vidal St; 0.1 Km N. of Churchill Rd. (38370-47546)	May 12/77
29	K	Vidal St; 0.1 Km. N. of Churchill Rd. (38370-47546)	May 12/77
31	O	Chippewa St. & Rose St. (38450-47565)	May 16/77
33	Q	Scott Rd; 1.3 Km. S. of St. Andrew St. (38600-47554)	May 17/77
35	L	Vidal St. & Confederation St. (38530-47573)	May 17/77
36	L	Vidal St. & Confederation St. (38530-47573)	May 17/77
37	R	Campbell St. & Mitton St. (38590-47570)	May 18/77
41	K	Vidal St. & Churchill Rd. (38370-47546)	May 18/77
42	K	Churchill Rd., 0.1 Km. E. of Vidal St. (38370-47546)	May 19/77
43	h	Huron Blvd; LIS Mon. Sta. (38490-47549)	May 19/77

TABLE 57

<u>Monitoring Period #</u>	<u>Map I.D.</u>	<u>Location & U.T.M. Co-ordinates</u>	<u>Date</u>
46	H	Hwy #40, N. of Corunna (38096-47506)	May 19/77
47	S	La Salle Rd. & Wahboose Circle (38150-475219)	May 20/77
48	*a	Chalet Motel (38560-47594)	May 24/77
49	X	Sunoco Dr. (38250-47536)	May 25/77
50	X	Sunoco Dr. (38250-47536)	May 25/77
52	X	Sunoco Dr. (38250-47536)	May 25/77
53	m	U.S.A. Hwy #29, S. tip Stag Isl. (37940-47469)	May 26/77
54	m	U.S.A. Hwy #29, S. tip Stag Isl. (37940-47469)	May 27/77
55	k	Vidal St. & Churchill Rd. (38370-47546)	May 30/77
56	X	Sunoco Dr. (38250-47536)	May 30/77
57	W	U.S.A. 16th St. & Military Rd. (38190-47554)	May 31/77
58	T	Devine St., West End (38485-47576)	May 31/77
59	*e	Moore Rd., 0.5 Km. S. of Hwy #80 (38220-47405)	June 1/77
60	*e	Moore Rd., 1.5 Km. S. of Hwy #80 (38220-47395)	June 1/77
61	*e	Moore Rd., 1.5 Km. S. of Hwy #80 (38220-47395)	June 1/77
64	V	Hwy #40 & Cooper St. (38240-47491)	June 2/77
101	Z	Vidal St. & St. Andrew St. (38520-47567)	Apr. 22/77

TABLE 58

<u>Monitoring Period #</u>	<u>Map I.D.</u>	<u>Location & U.T.M. Co-ordinates</u>	<u>Date</u>
104	Z	Vidal St. & St. Andrew St. (38520-47567)	Apr. 26/77
105	Z	Vidal St. & St. Andrew St. (38520-47567)	Apr. 26/77
107	A	Vidal St. & Kenny Rd. (38440-47555)	Apr. 27/77
108	A	Vidal St. & Kenny Rd. (38440-47555)	Apr. 27/77
109	Q	Scott Rd., 1.2 Km. S. of St. Andrew (38600-47554)	May 4/77
110	Z	Vidal St. & Imp. Oil Gate (38510-47566)	May 4/77
112	Y	Vidal St. 7 Polysar Pk Lot (38420-47554)	May 4/77
113	A	Vidal St. & Kenny Rd. (38440-47555)	May 5/77
114	A	Vidal St. & Kenny Rd. (384409-47555)	May 5/77
115	Y	Vidal St. & Polysar Pk Lot (38420-47554)	May 5/77
117	Z	Vidal St., & Imp. Oil Gate (38510-47519)	May 6/77
118	D	Hwy #40 & LaSalle Rd. (38110-47519)	May 11/77
120	Z	Vidal St. & Imp. Oil Gate (38510-47566)	May 12/77
122	Q	Scott Rd., 1.0 Km. S. of St. Andrew St. (38600-47557)	May 12/77
123	K	Vidal St. 0.065 Km. N. of Churchill St. (38370-47554)	May 13/77
124	A	Kenny Rd., 0.1 Km. E. of Vidal St. (38450-47554)	May 16/77
125	*n	Hwy #40, 0.15 Km. N. of Hwy #80 (38420-47418)	May 17/77

TABLE 59

<u>Monitoring Period #</u>	<u>Map I.D.</u>	<u>Location & U.T.M. Co-ordinates</u>	<u>Date</u>
128	*f	Petrolia: Eureka St. & Blind Line (40600-47495)	May 18/77
129	*f	Petrolia: Centre St. & Blind Line (40610 - 47496)	May 18/77
130	*a	Chalet Motel (38560-47594)	May 18/77
131	*f	Petrolia: Centre St. & Blind Line (40610-47496)	May 19/77
133	I	Beckwith & Colborne Sts. (38220-47497)	May 20/77
135	K	Vidal st. & Churchill Rd. (38360-47546)	May 24/77
136	K	Vidal St., Front of Dow Chem. (38350-47545)	May 25/77
137	F	LaSalle Rd; 0.5 Km. W. of Tashmoo Ave. (38390-47518)	May 25/77
138	D	Hwy #40 & LaSalle Rd. (38110-47519)	May 25/77
139	D	LaSalle Rd. & Hwy #40 (38110-47519)	May 25/77
141	K	Hwy #40 & Dow Chem. (38350-47545)	May 26/77
142	H	Hwy #40, N. of Corunna (38100-47505)	May 26/77
143	H	Hwy #40, N. of Corunna (38100-47505)	May 27/77
145	*t	Hwy #40; Front of Lambton Gen. Sta. (37950-47394)	May 30/77
146	g	Hwy #40 near Sunoco (38190-47543)	May 31/77
147	*a	Chalet Motel (38560-47594)	May 31/77
150	n	Hwy #40, 0.5 Km. N. Hwy #80 (38410-47414)	June 1/77

TABLE 60

<u>Monitoring Period #</u>	<u>Map I.D.</u>	<u>Location # U.T.M. Co-ordinates</u>	<u>Date</u>
152	n	Hwy #40, 0.5 Km. S. Hwy #80 (38405-47404)	June 1/77
153	n	Hwy #40, 0.4 Km. N. Moore Rd. #2 (38400-47388)	June 1/77
154	n	Hwy #40, 0.3 Km. N. Moore Rd. #2 (38400-47388)	June 1/77
158	Y	Corunna: Hill & Beresford Sts. (38130-47492)	May 10/77
159	H	Hwy #40; N. of Corunna (38110-47501)	May 10/77

* These sites are not shown on the enclosed maps.

TABLE 61

Mobile Air Monitoring Sites
All Monitoring Periods Were Logged As
Sarnia # X

<u>Monitoring Period #</u>	<u>Map I.D.</u>	<u>Location & U.T.M. Co-ordinates</u>	<u>Date</u>
1		O.M.E. Pt. Edward Plant; 5.0 Km. & 000 DGS/IMP (03845-47618)	Oct. 11/78
2		O.M.E. Pt. Edward Plant; 5.0 Km. & 000 DGS/IMP (03845-47618)	Oct. 11/78
3		Petrosar Warehouse; 0.35 Km. & 060 DGS/PETSR (03859-47486)	Oct. 12/78
4	A	Scott Rd.; 1.2 Km. & 130 DGS/ESS (03860-47555)	Oct. 12/78
5	B	St. Andrew St.; 1.0 Km & 045 DGS/ESS (03860-47565)	Oct. 12/78
6	C	St. Andrew St.; 0.7 Km & 010 DGS/ESS (03852-47567)	Oct. 12/78
7	D	Churchill Rd.; 1.6 Km. & 160 DGS/IMP (03853-47545)	Oct. 13/78
8	E	Kenny Rd.; .05 Km. & 210 DGS/FIB (03845-47555)	Oct. 13/78
9	F	Sunoco Dr.; 0.1 Km. & 210 DGS/SUN (03823-47537)	Oct. 13/78
10	E	Kenny Rd.; 0.05 Km. & 210 DGS/FIB (03844-47554)	Oct. 13/78
12	G	Churchill Rd. & Tashmoo Ave.; 0.2 Km. & 230 DGS/STY (03844-47545)	Oct. 14/78
13	G	Churchill Rd. & Tashmoo Ave.; 0.2 Km. & 230 DGS/STY (03844-47545)	Oct. 14/78

TABLE 62

<u>Monitoring Period #</u>	<u>Map I.D.</u>	<u>Location & U.T.M. Co-ordinates</u>	<u>Date</u>
15		Chalet Motel; 3.5 Km. & 015 DGS/IMP (03856-47593)	Oct. 15/78
16		Park Opp. Shell Hwy #40B; .5 Km. & 240 DGS/SHL (03810-47506)	Oct. 16/78
17		Hwy #40B & Beckwith; 1.8 Km. & 205 DGS/SHL (03812-47497)	Oct. 16/78
18	H	Huron Blvd & Tashmoo Ave.; 0.4 Km. & 200 DGS/CAB (03843-47549)	Oct. 16/78
19	I	Hwy #40B, Sun-Dow Curve; 0.3 Km. & 040 DGS/CAB (03828-47541)	Oct. 17/78
20		LaSalle Rd. at Train Tracks; 1.0 Km. & 045 DGS/SHL (03825-47518)	Oct. 17/78
21	J	Huron Blvd; 0.2 Km. & 030 DGS/STY (03847-47549)	Oct. 17/78
22	J	Huron Blvd; 0.2 Km. & 010 DGS/STY (03846-47549)	Oct. 17/78
23	J	Huron Blvd; 0.2 Km. & 030 DGS/STY (03847-47549)	Oct. 18/78
24	C	Vidal St. & St. Andrew St.; 0.7 Km. & 070 DGS/IMP (03853-47567)	Oct. 19/78
25	K	Vidal St., South End; 1.0 Km. & 130 DGS/DOWSTK (03834-47542)	Oct. 19/78
26	L	Clifford St., near Vidal St.; 0.5 Km. & 045 DGS/IMP (03850-47565)	Oct. 20/78
27	M	Huron Blvd; 0.6 Km. & 135 DGS/CABSTK (03849-47549)	Oct. 20/78
28	N	Christina & St. Andrew Sts.; 0.7 Km & 020 DGS/ESSSTK (03848-47569)	Oct. 21/78

TABLE 63

<u>Monitoring Period #</u>	<u>Map I.D.</u>	<u>Location & U.T.M. Co-ordinates</u>	<u>Date</u>
29	N	Christina & St. Andrew Sts.; 0.7 Km. & 020 DGS/ESSSTK (03848-47569)	Oct. 21/78
31	N	Christina & St. Andrew Sts.; 0.7 Km. & 020 DGS/ESSSTK (03848-47569)	Oct. 21/78
32	O	Vidal St. & Lochiel St.; 2.8 Km. & 020 DGS/ESSSTK (03854-47586)	Oct. 22/78
33		Chalet Motel; 3.5 Km. & 015 DGS/IMP (03856-47593)	Oct. 22/78
35	I	Hwy #40, Sun-Dow Curve; 0.3 Km. & 040 DGS/SUN (03827-47542)	Oct. 24/78
36	J	Huron Blvd; 0.125 Km. & 000 DGS/STY (03845-47549)	Oct. 25/78
38	P	Tashmoo Ave; 0.25 Km. & 135 DGS/IMPSTK (03844-47555)	Oct. 26/78
40	H	Huron Blvd; 0.3 Km. & 170 DGS/CABSTK (03848-47549)	Oct. 27/78
41		Road to Dupont; 1.2 Km. & 160 DGS/SHL (03827-47501)	Oct. 29/78
42		Chalet Motel; 3.0 Km. & 020 DGS/IMP (03856-47593)	Oct. 30/78
43		Chalet Motel; 3.5 Km. & 015 DGS/IMP (03856-47593)	Oct. 31/78
44		LaSalle Rd., 0.2 Km. of Tashmoo Ave.; 4.5 Km. & 180 DGS/IMP (03842-47518)	Oct. 31/78
46	G	Churchill Rd., 0.1 Km. W. of Tashmoo; 1.0 Km. & 180 DGS/IMPCAB (03843-47545)	Oct. 31/78
47	Q	Vidal St. & Huron Blvd; Background (03840-47550)	Nov. 1/78
49		Chalet Motel; Light SE Winds (03856-47593)	Nov. 1/78

TABLE 64

<u>Monitoring Period #</u>	<u>Map I.D.</u>	<u>Location & U.T.M. Co-ordinates</u>	<u>Date</u>
51	J	Huron Blvd; 0.1 Km. & 025 DGS/STY (03847-47549)	Nov. 2/78
53	C	St. Andrew St.; 0.7 Km. & 025 DGS/IMP (03847-47566)	Nov. 3/78

B. Concentration/Time Plots

Each of the plots is a smooth trace through a certain number of points which represent 60-minute average concentrations of the monitored contaminants corresponding to the intervals shown on the "time" axis. The number of points plotted depends on the monitoring period duration and the scan time as follows:

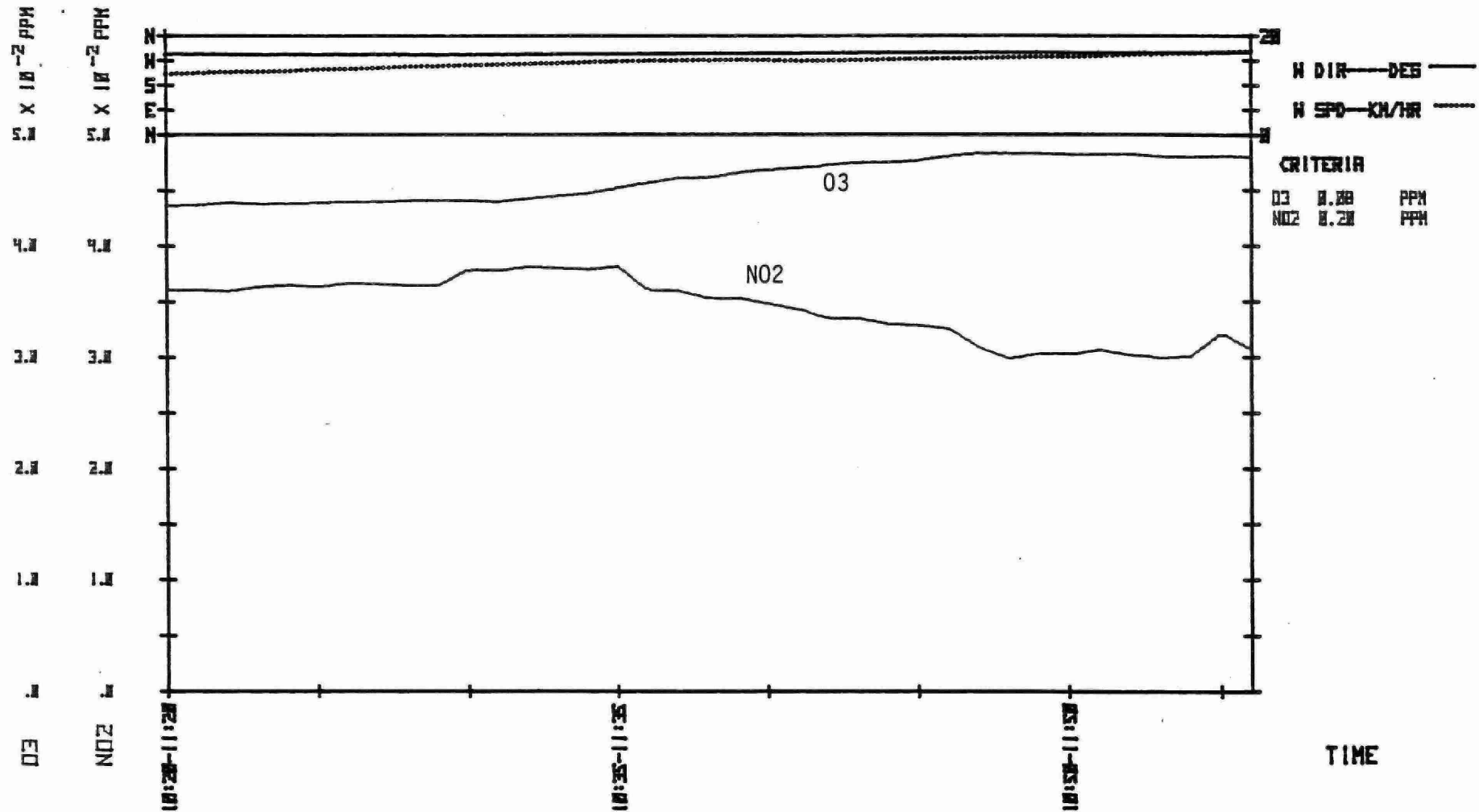
$$\text{number of points} = \frac{\text{duration(minutes)}-60}{\text{scan time (minutes)}}$$

SARNIA #12

10:20 MAY 6 1977 SCAN= 60 SEC AVE= 60 MIN
 CHURCHILL RD & TREHNO RD (39°42'47.5"E) N. 90N, 280 DEG, HF DON CHEN

27
 988

TEMP DEG C
 PRES HBAR



SARNIA #14

15:44 MAY 9 1977

SCAN= 60

SEC

AVE= 60

MIN

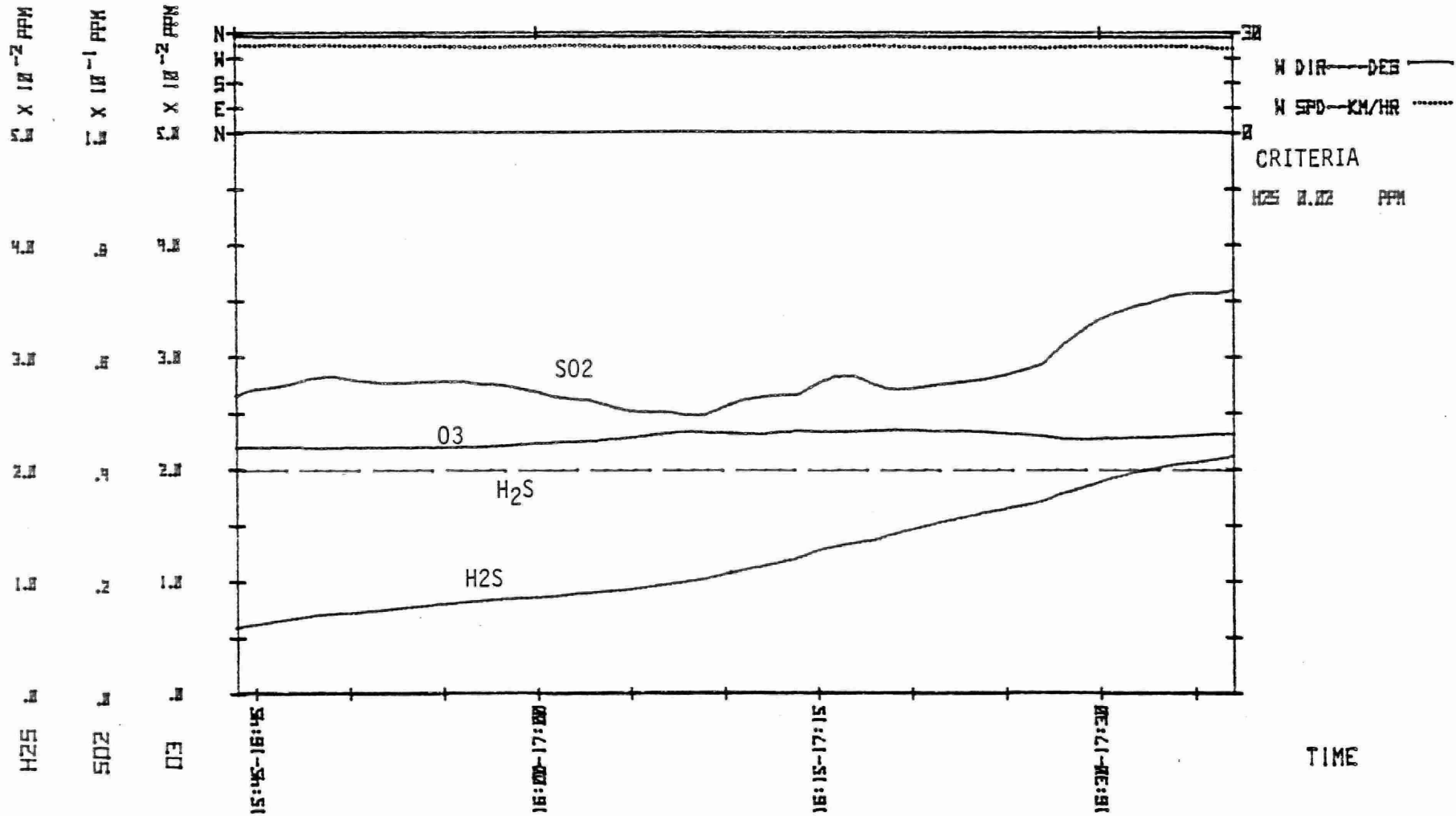
TASHMOD RD: 1.3KM N OF LASALLE; (38438-475388) 1KM, 2000EG, OF IMP.OIL

10
998

10
998

9
998

TEMP DEG C
PRES MBAR

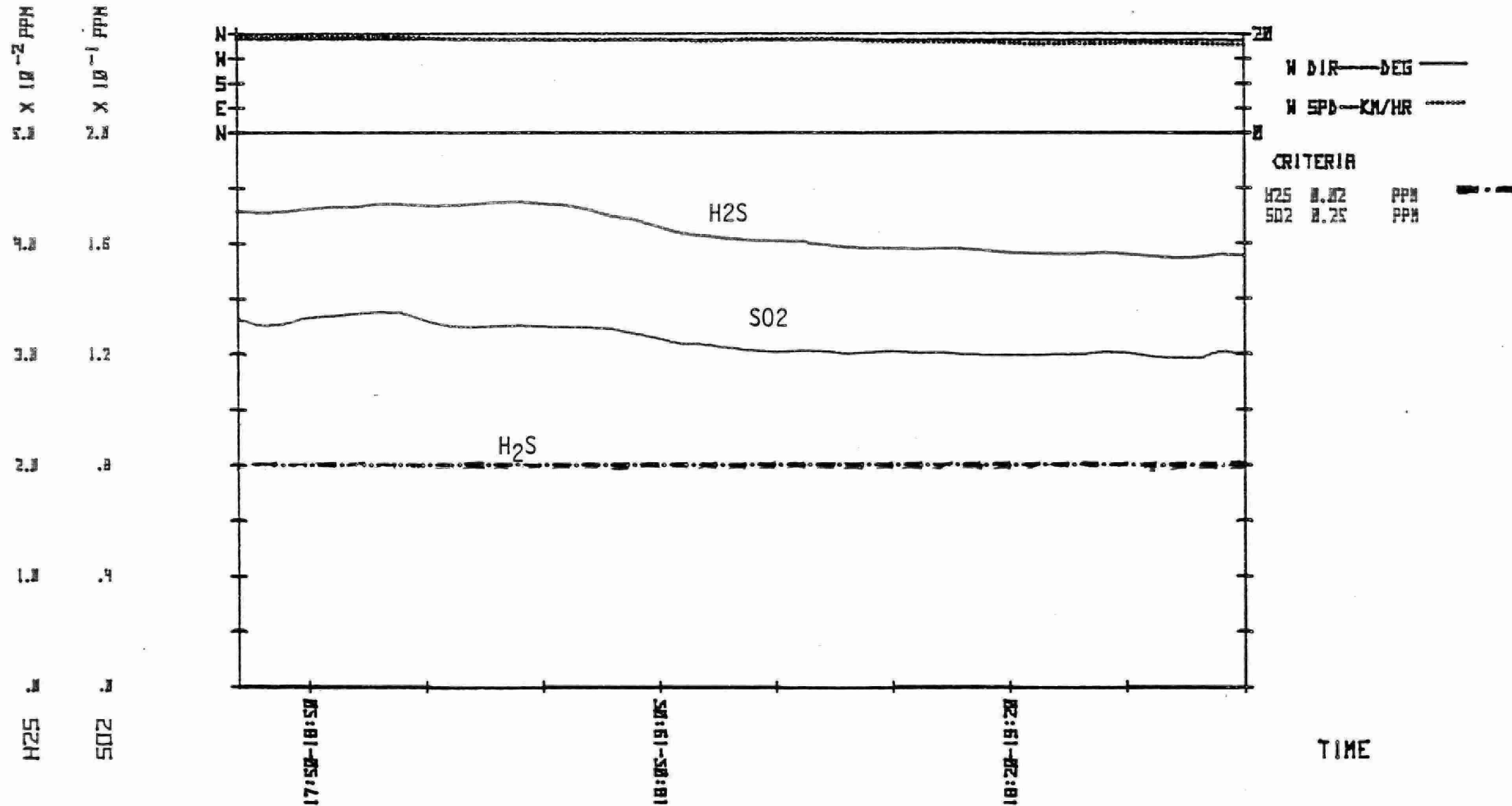


SARNIA #15

17:47 MAY 9 1977 SCAN= 60 SEC AVE= 60 MIN
TASHMO RD: 100M S OF CHURCHILL; (3843N-47545W) 700M, 160 DEG, OF IMP.OIL

9
998

TEMP DEG C
PRES MBAR



SARNIA #28

17:19 MAY 12 1977

SCFM= 68 SEC AVE= 68 MIN

VIDAL RD: 150M N OF CHURCHILL; (3837N-47546E) 5200M, 210 DEG, OF IMP.DIL

27
993

26
993

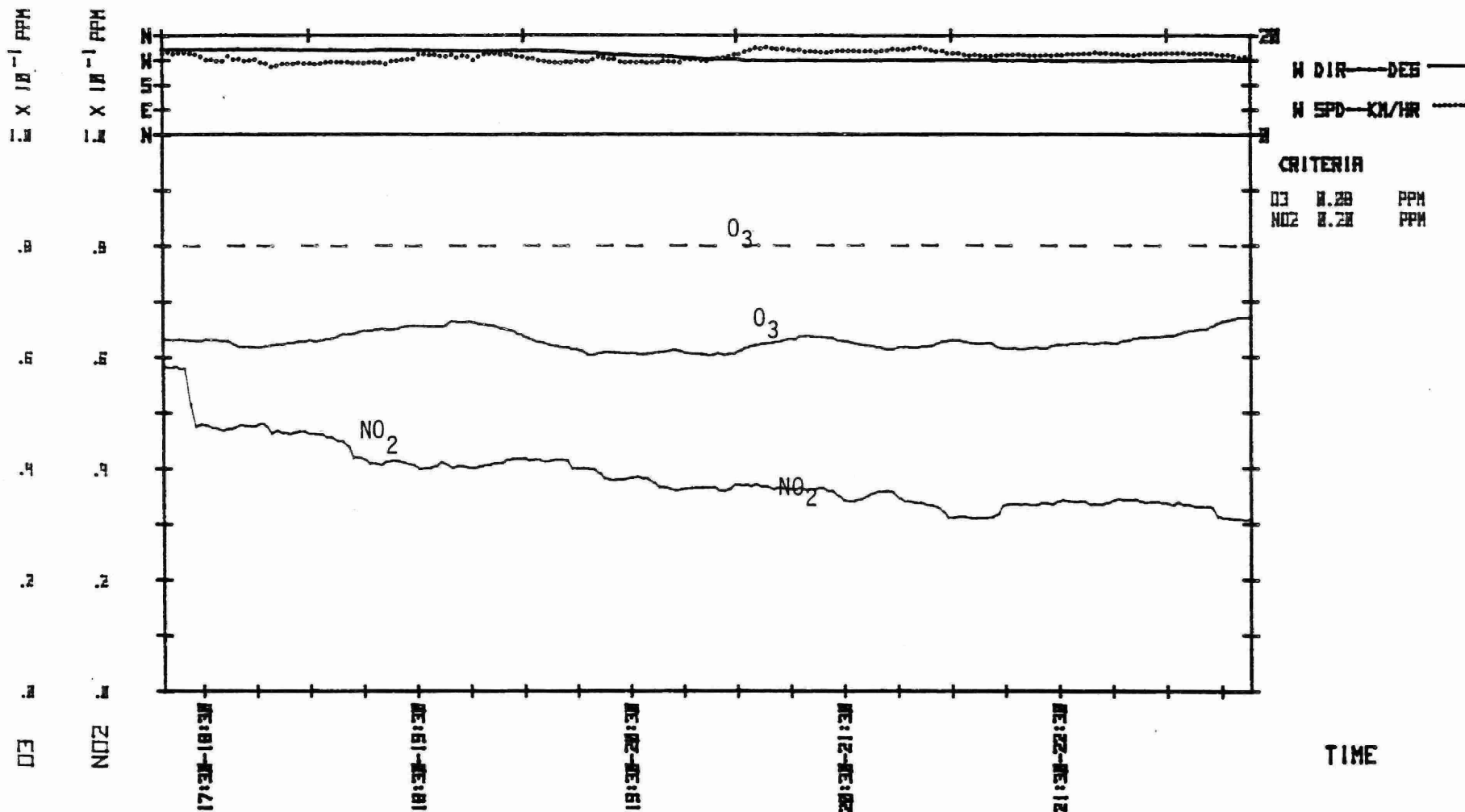
25
993

23
992

22
993

21
993

TEMP DEG C
PRES NEAR



SARNIA #29

23:32 MAY 12 1977

SCAN= 60 SEC

AVE= 60 MIN

VIDAL RD: 150M N OF CHURCHILL; (38373-475468) 500M, 210 DEG, OF IMP.OIL

19
993

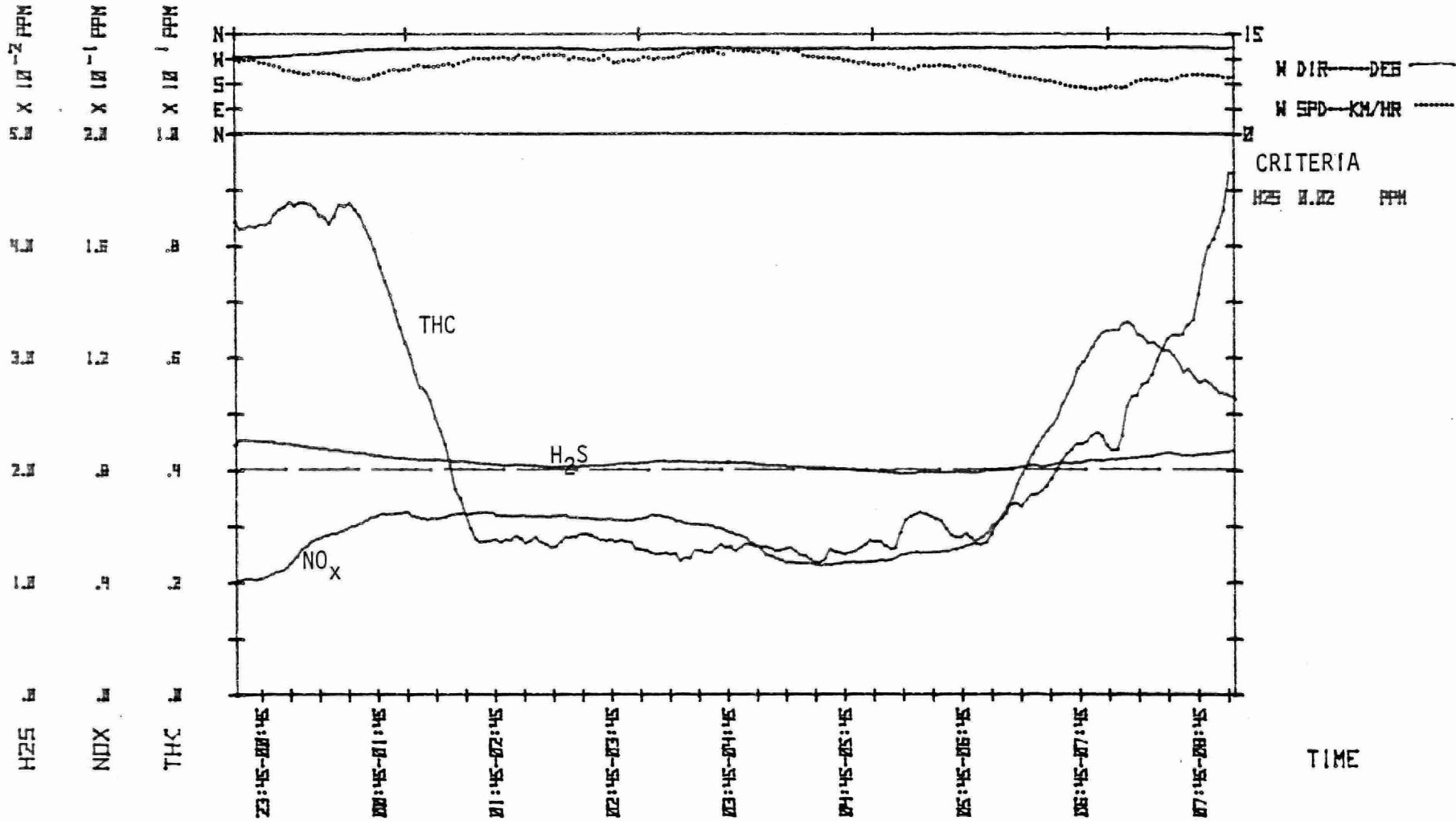
18
993

17
992

16
992

18
993

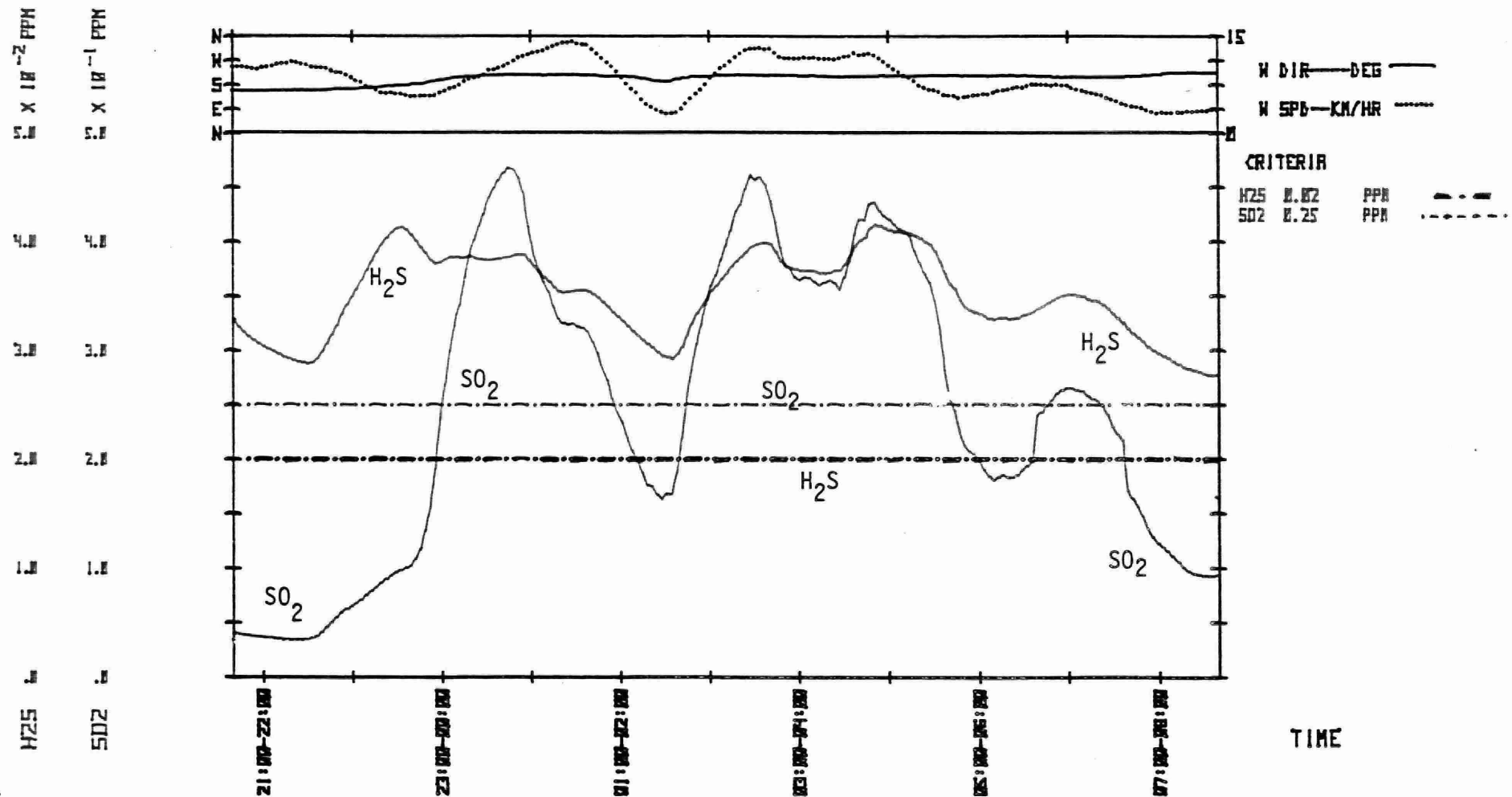
TEMP DEG C
PRES MBAR



SARNIA #31

20:40 MAY 16 1977 SCAN= 60 SEC AVE= 60 MIN
 CHIPPEWA & ROSE STS; (38450-475650); 1.2KM, 2 DEG. OF CABOT CARBON IND

25 22 21 20 20 20
 998 998 998 997 997 998 TEMP DEG C
 PRES MBAR



SARNIA #33

12:18 MAY 17 1977

SCAN= 60 SEC AVE= 60 MIN

SCOTT RD, 1.3KM S OF ST. ANDREW ST; (3861N-4752E) 1KM, SMOG OF IMP. OIL

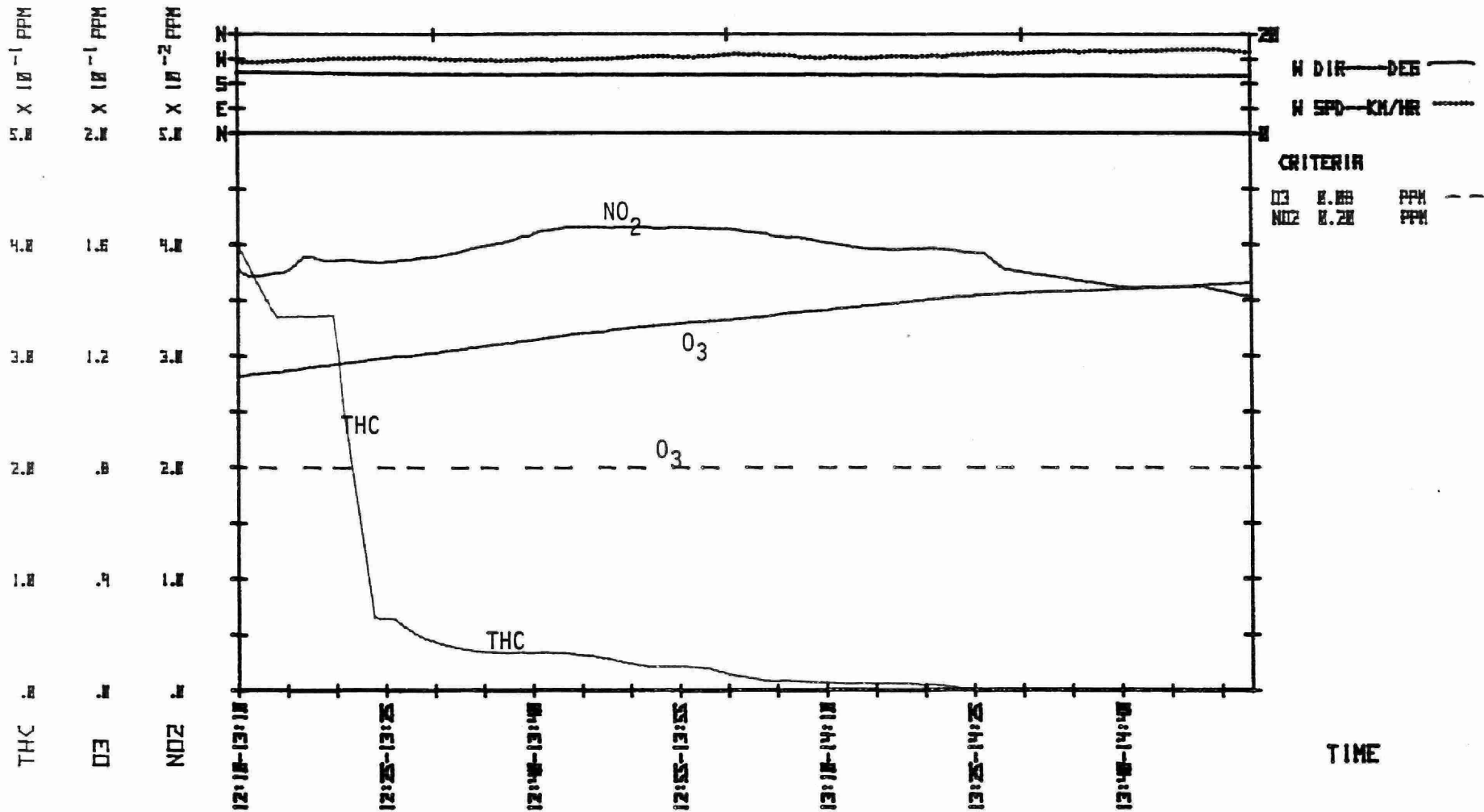
36
997

35
997

35
996

35
996

TEMP DEG C
PRES HBAR



SARNIA #35

17:29 MAY 17 1977

SCAN= 60

SEC

AVE= 60

MIN

VIOLE & CONFEDERATION RD 5/ (38538-475788), 1KM, WEG, OF IMP.OIL

37
1974

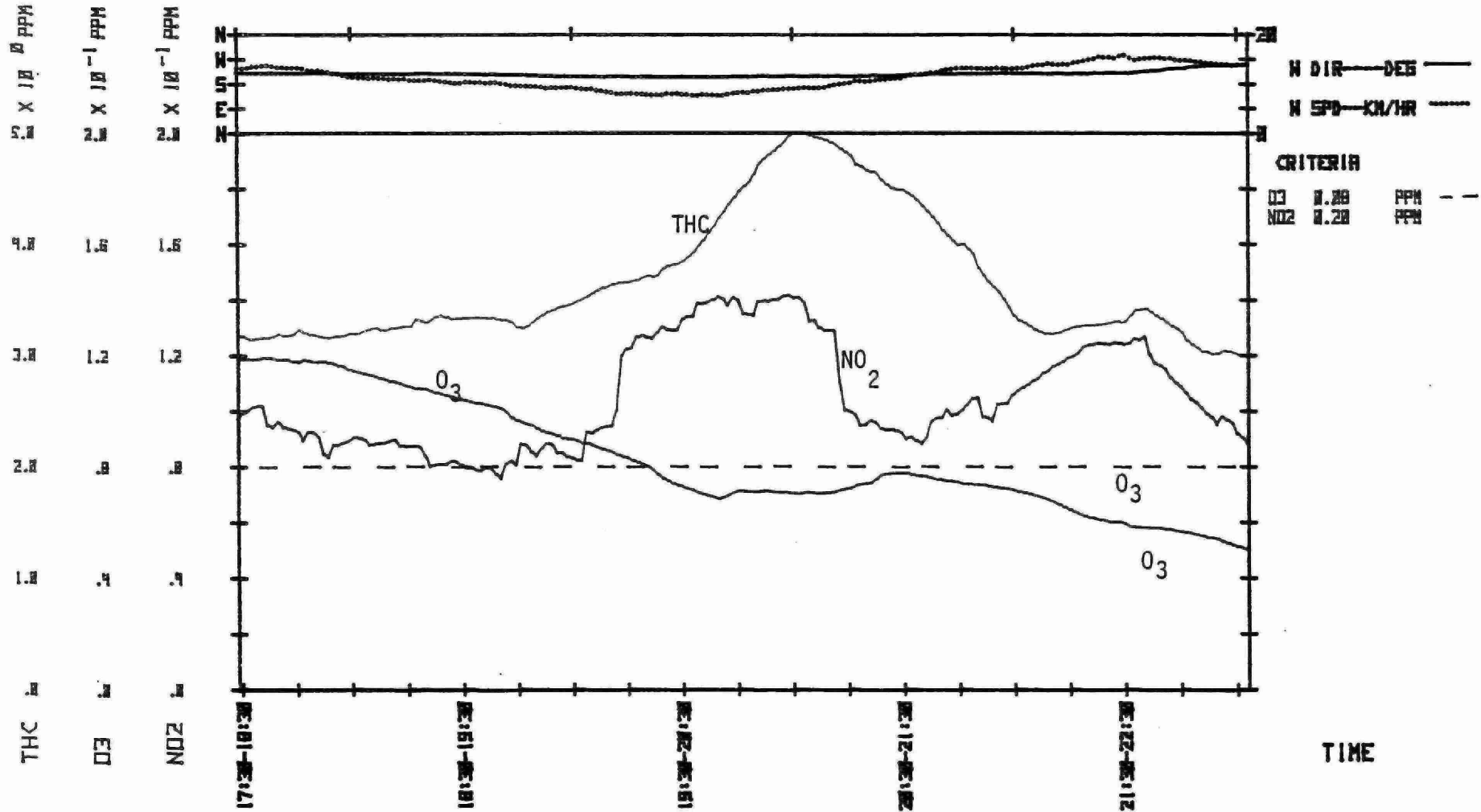
35
1974

31
1974

29
1974

27
1974

24 TEMP DEG C
995 PRES HBAR



SARNIA #49

09:14 MAY 25 1977

SCAN= 60 SEC

AVE= 60 MIN

SUNOCO DR: 100M E OF HWY#103, (38200-475300), 30M, 245 DEG, OF SUNOCO

0.018
21
999

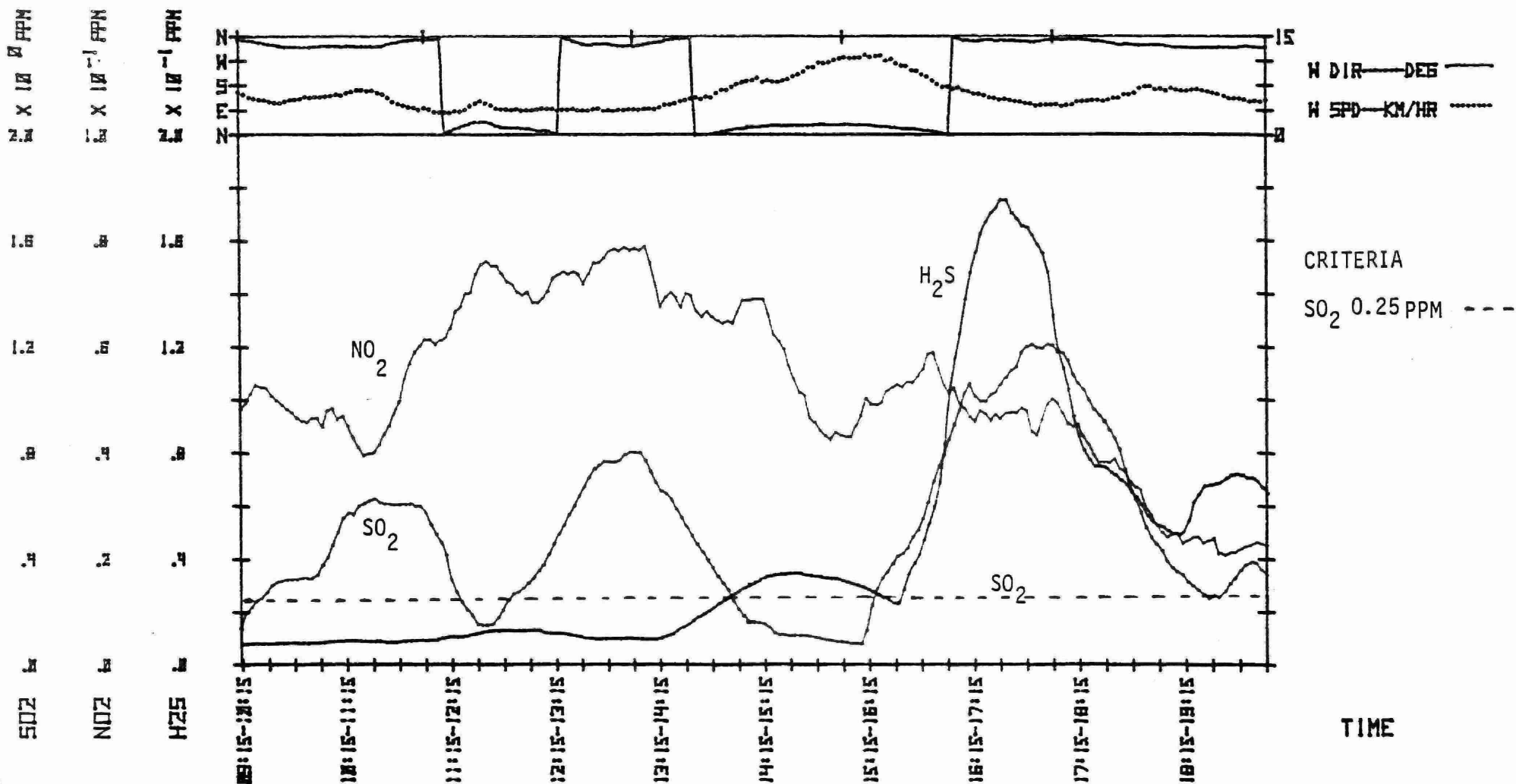
0.071
24
999

0.097
25
999

0.077
28
999

0.053
28
999

SRAD W/CH2
TEMP DEG C
PRES MBAR



SARNIA #49

09:14 MAY 25 1977

SCAN= 60 SEC AVE= 60 MIN

SUNOCO DR: 100M E OF HWY#408; (38200-475388), 30M, 245 DEG, OF SUNOCO

0.018
21
999

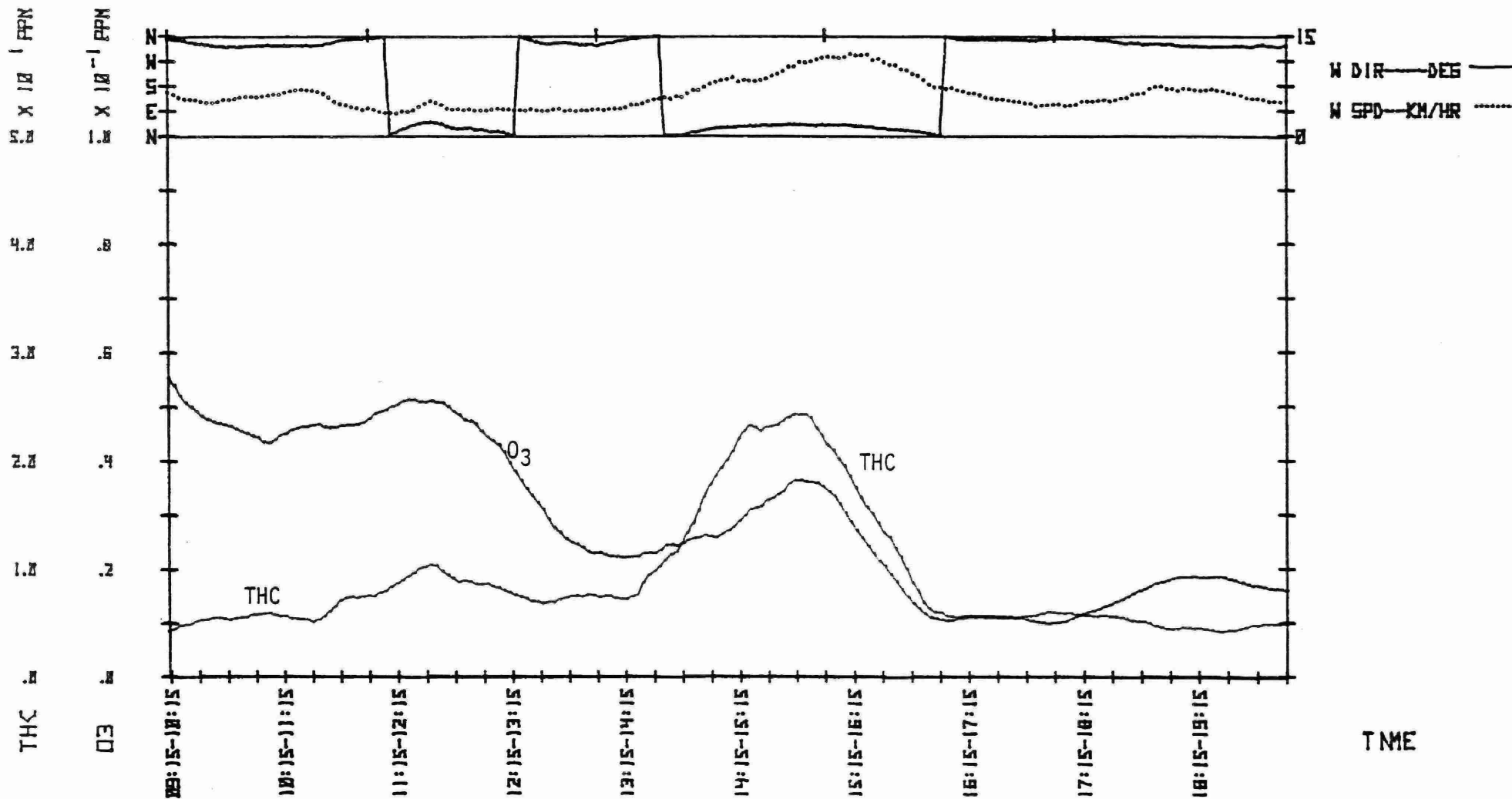
0.071
24
999

0.087
26
999

0.077
28
999

0.053
28
999

SRAD W/CM2
TEMP DEG C
PRES MBAR



SARNIA #50

21:28 MAY 25 1977

SCAN= 60 SEC

AVE= 60 MIN

SUNOCO DR: 100M E OF HWY#408; (38250-475380), 30M, 245DEG, OF STRCK

0.000
17
997

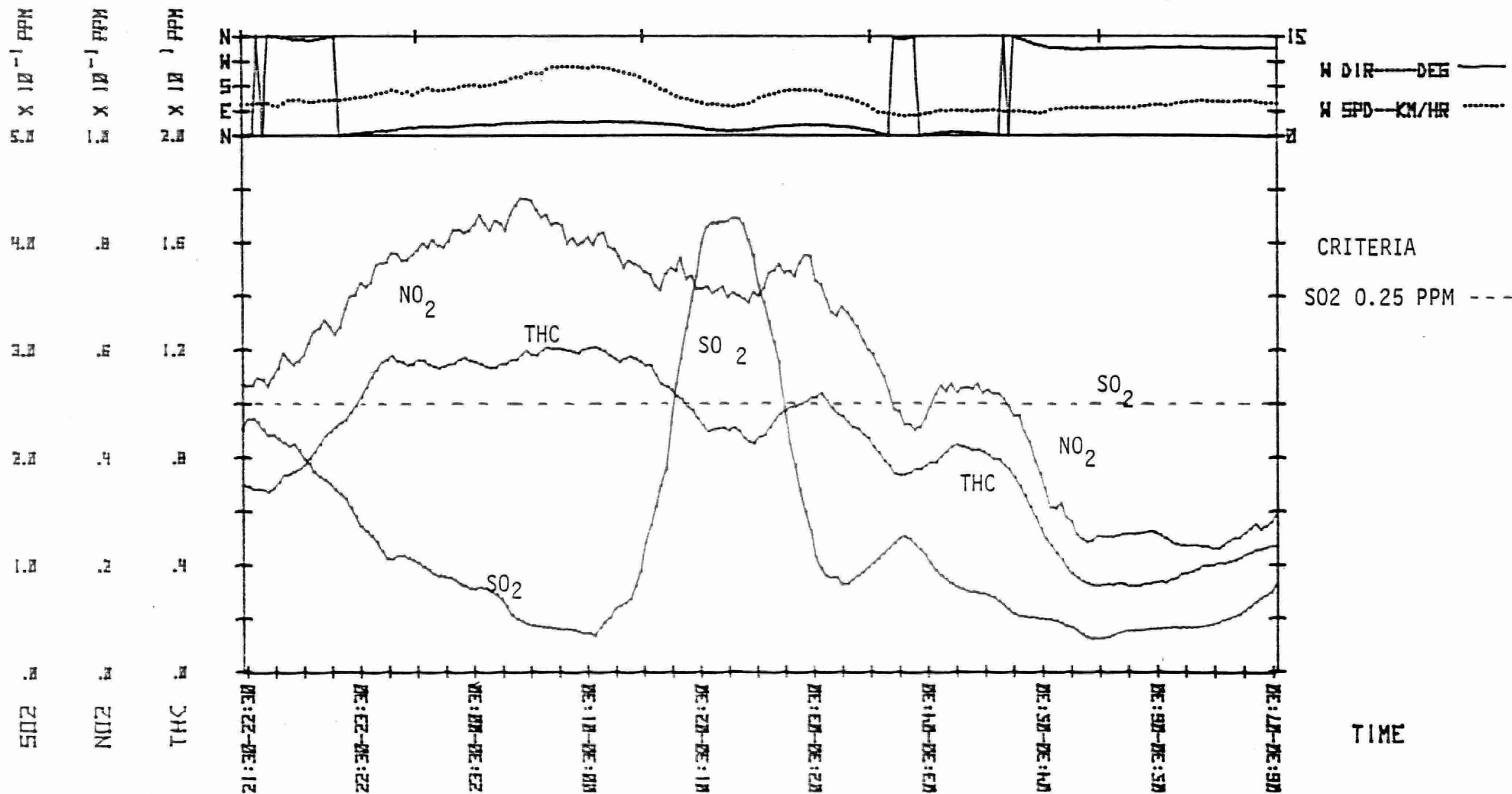
0.000
16
997

0.000
16
997

0.000
15
997

0.000
13
997

SRAD W/CM2
TEMP DEG C
PRES MBAR



SARNIA #52

11:16 MAY 26 1977

SCAN= 60 SEC AVE= 60 MIN

SUNOCO DR: 100M E OF HWY#408; (38200-475300), 30M, 245 DEG, OF SUNOCO

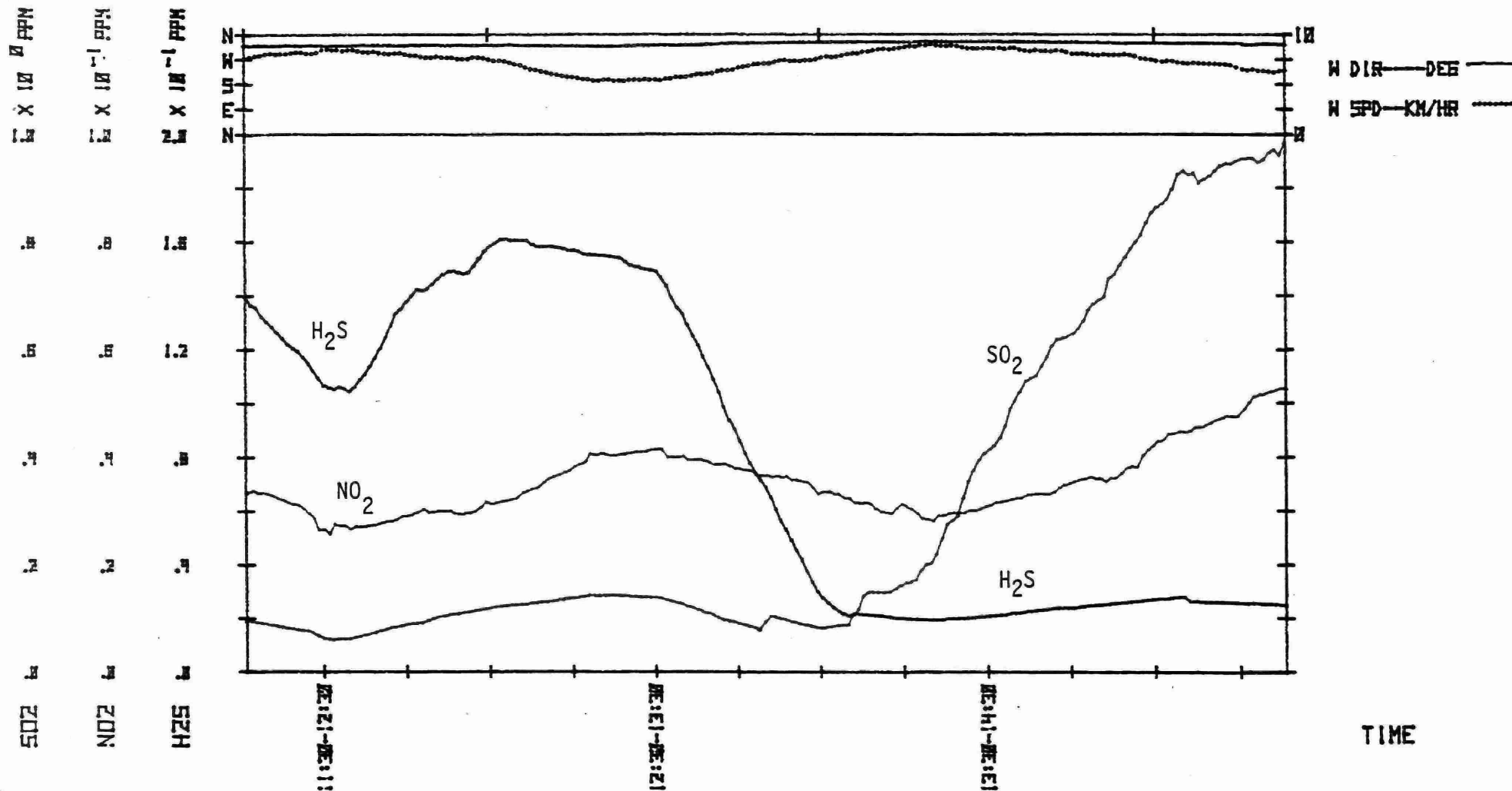
0.075
20
997

0.080
21
997

0.085
24
997

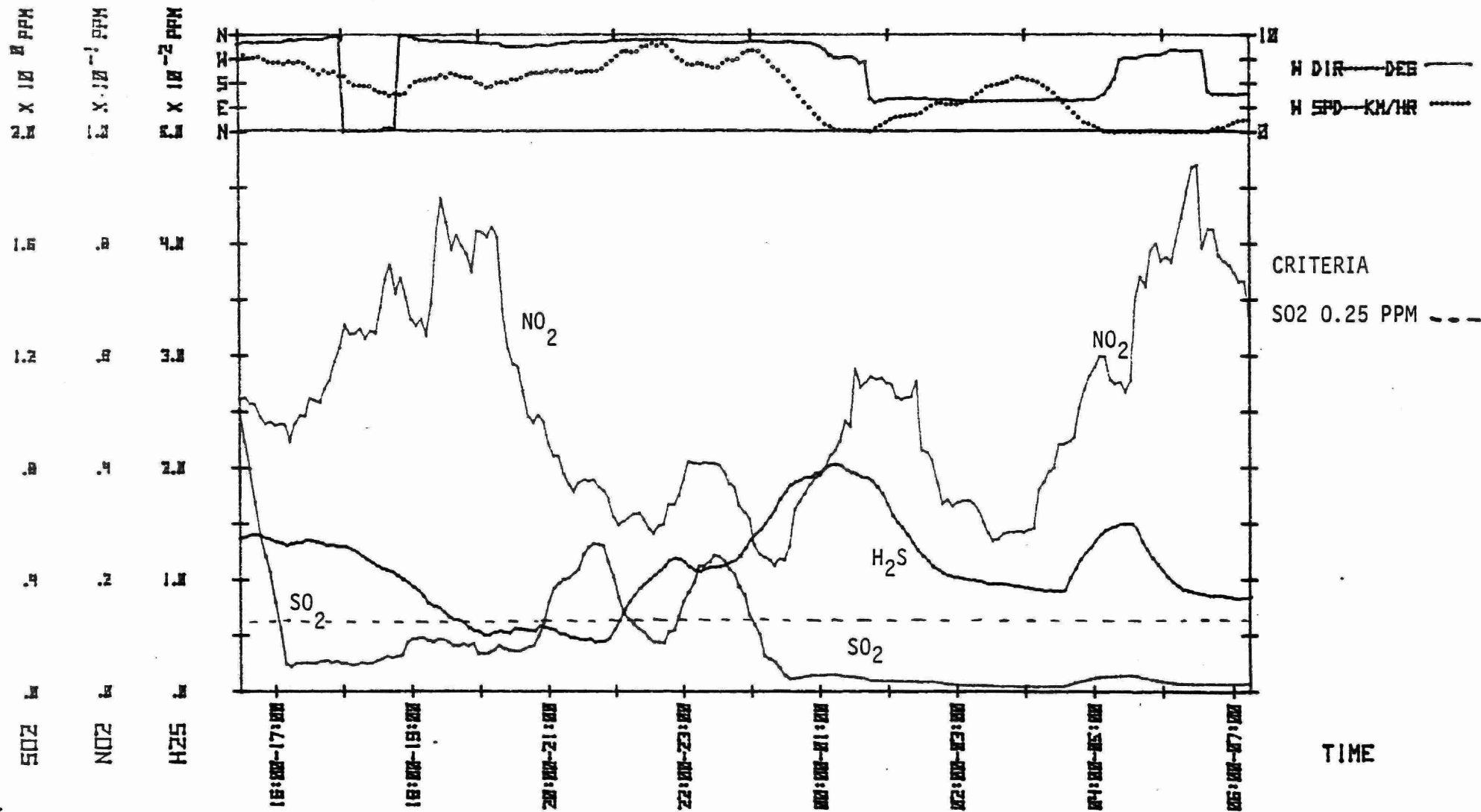
0.085
25
996

SRAD W/CH2
TEMP DEG C
PRES MBAR



15:29 MAY 30 1977 5CRN= 60 SEC RVE= 60 MIN
SUNOCO DR: 100M E OF HWY#406; (38252-475360), 30M, 23RD EG, OF SUNOCO

SECRET



SARNIA #58

23:06 MAY 31 1977

SCAN= 60 SEC

AVE= 60 MIN

BELTON LUMBER ON DEVINE ST.; (38465-475768)

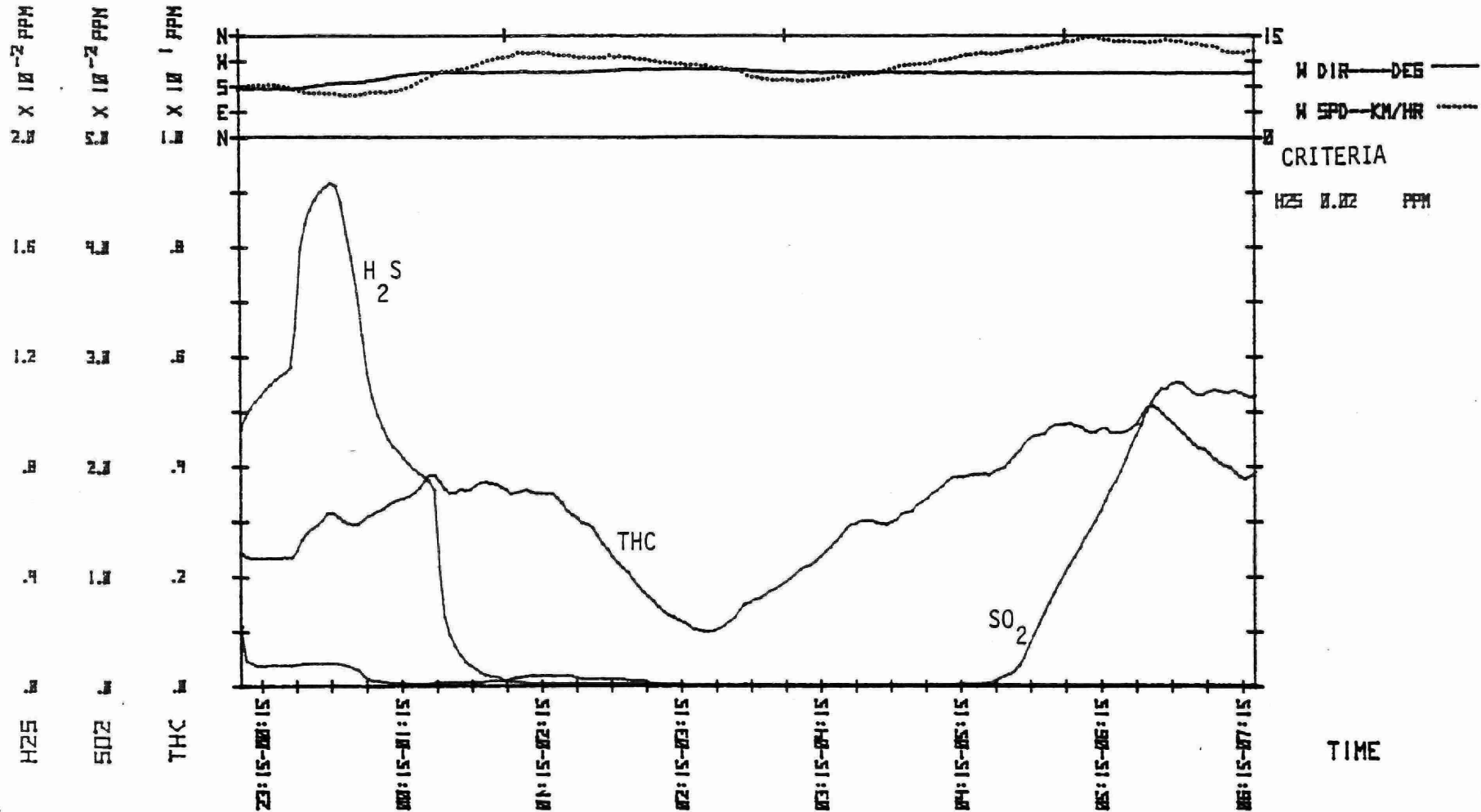
0.000
28
983

0.000
19
982

0.000
18
981

0.000
17
980

SRD W/CH2
TEMP DEG C
PRES MBAR



SARNIA #108

14:00 APR 27 1977

SCAN# 60

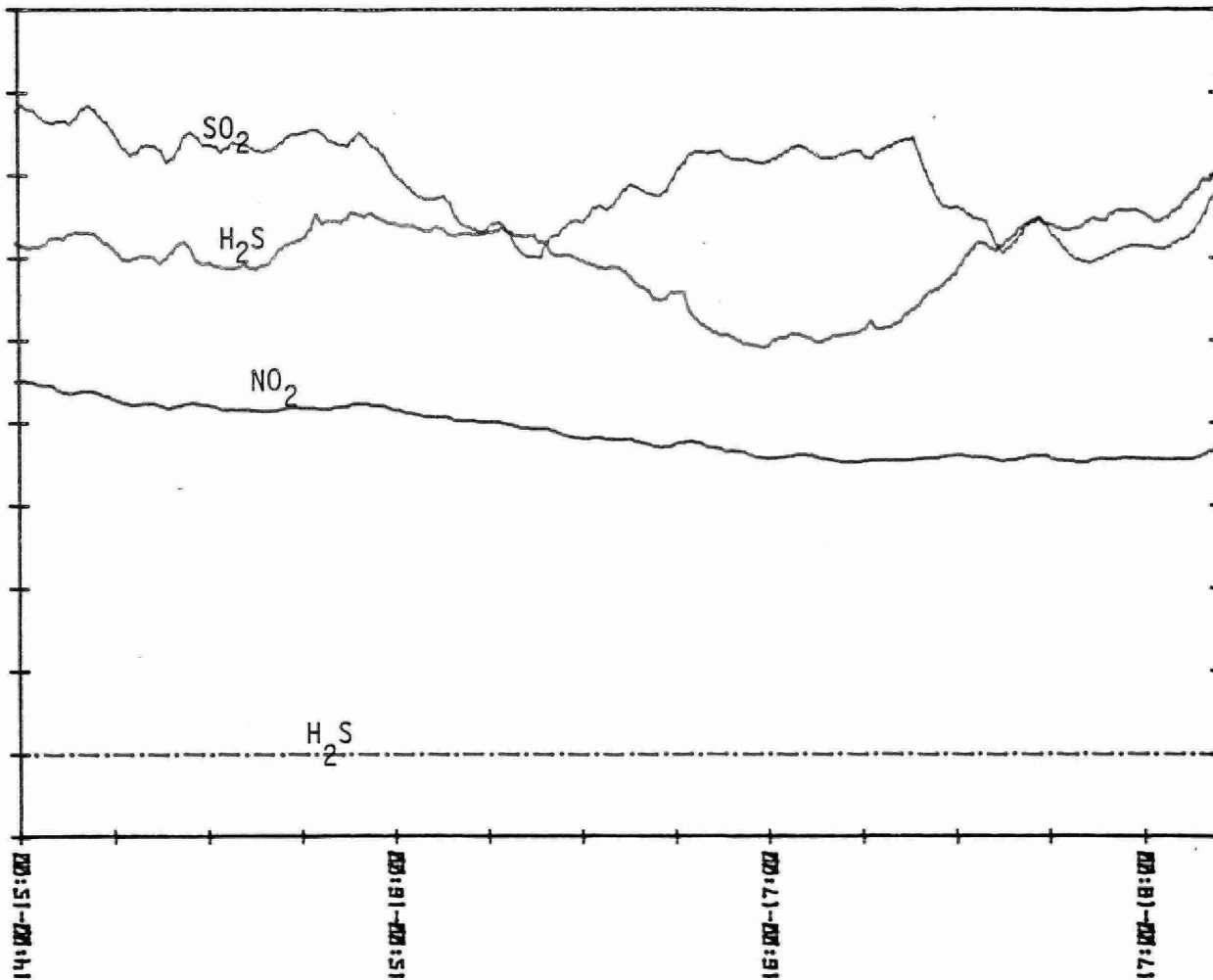
SEC

AVE# 60

MIN

KENNY & VIDAL RDS.; (38448-475550)

$\times 10^{-1}$ PPM
 $\times 10^{-1}$ PPM
 $\times 10^{-1}$ PPM
 2.0 2.0 2.0
 1.6 1.6 1.6
 1.2 1.2 1.2
 .8 .8 .8
 .4 .4 .4
 .0 .0 .0
 H2S SO2 NO2



CRITERIA

H2S	0.02	PPM
SO2	0.25	PPM
NO2	0.20	PPM

TIME

SARNIA #113

12:58 MAY 5 1977

SCAN# 60

SEC

AVE# 60

MIN

KEJAY A TASHMOD RDS; (38448-475550)

1.0 X 10⁻¹ PPM
2.0 X 10⁻¹ PPM
3.0 X 10⁻¹ PPM

0.8 0.4 1.6

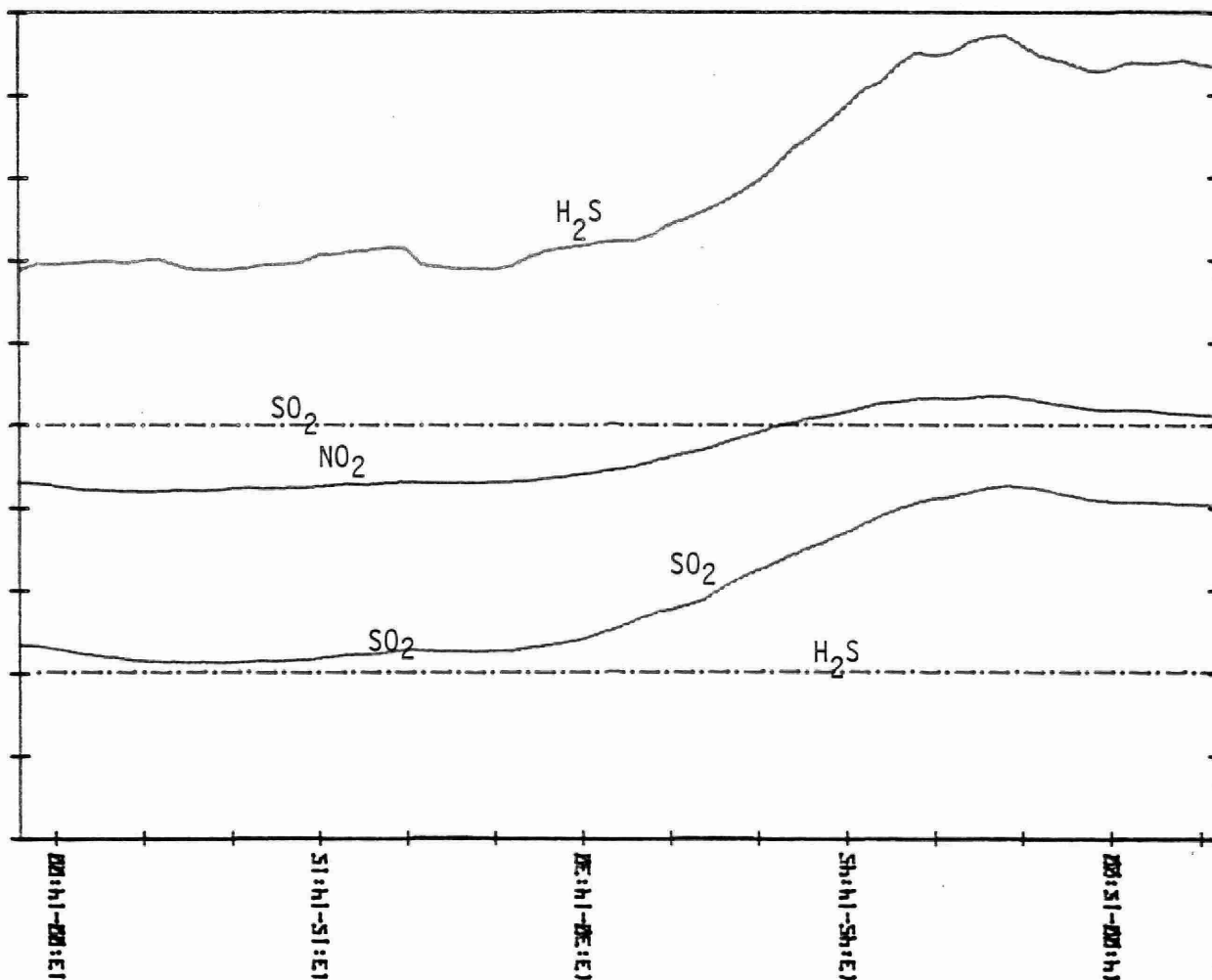
0.6 0.3 1.2

0.4 0.2 0.8

0.2 0.1 0.4

0.0 0.0 0.0

H2S
SO2
NO2



CRITERIA

H2S	0.02	PPM
SO2	0.25	PPM
NO2	0.20	PPM

TIME

SARNIA #122

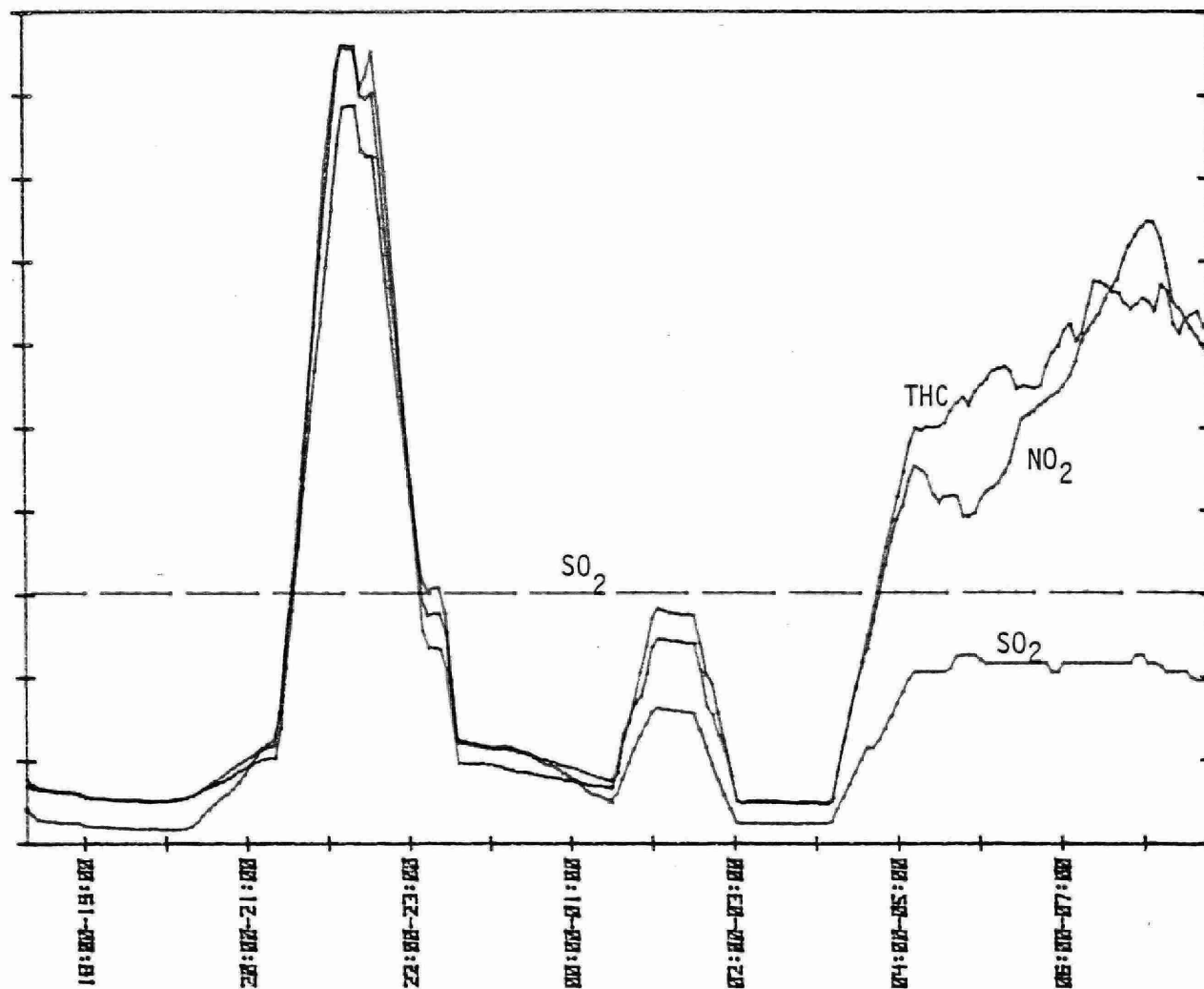
17:17 MAY 12 1977

SCAN= 100 SEC

AVE= 60 MIN

SCOTT RD: 1KM S OF ST. ANDREW ST.: (38600-47557)

SO₂ 1 X 10⁻³ PPM
NO₂ 2 X 10⁻³ PPM
THC 2 X 10⁻³ PPM



TIME

SARNIA #131

08:25 MAY 19 1977

SCAN# 60

SEC

AVE# 60

MIN

PETROLIA: CENTRE ST. & BLIND LINE (40612-474960)

PPH
1.0 X 10⁻¹
1.0 X 10⁻¹
1.0 X 10⁻¹

0.8

0.6

0.4

0.2

0.0

H2S

PPH
1.0 X 10⁻¹
1.0 X 10⁻¹
1.0 X 10⁻¹

0.8

0.6

0.4

0.2

0.0

THC

PPH
1.0 X 10⁻¹
1.0 X 10⁻¹
1.0 X 10⁻¹

0.8

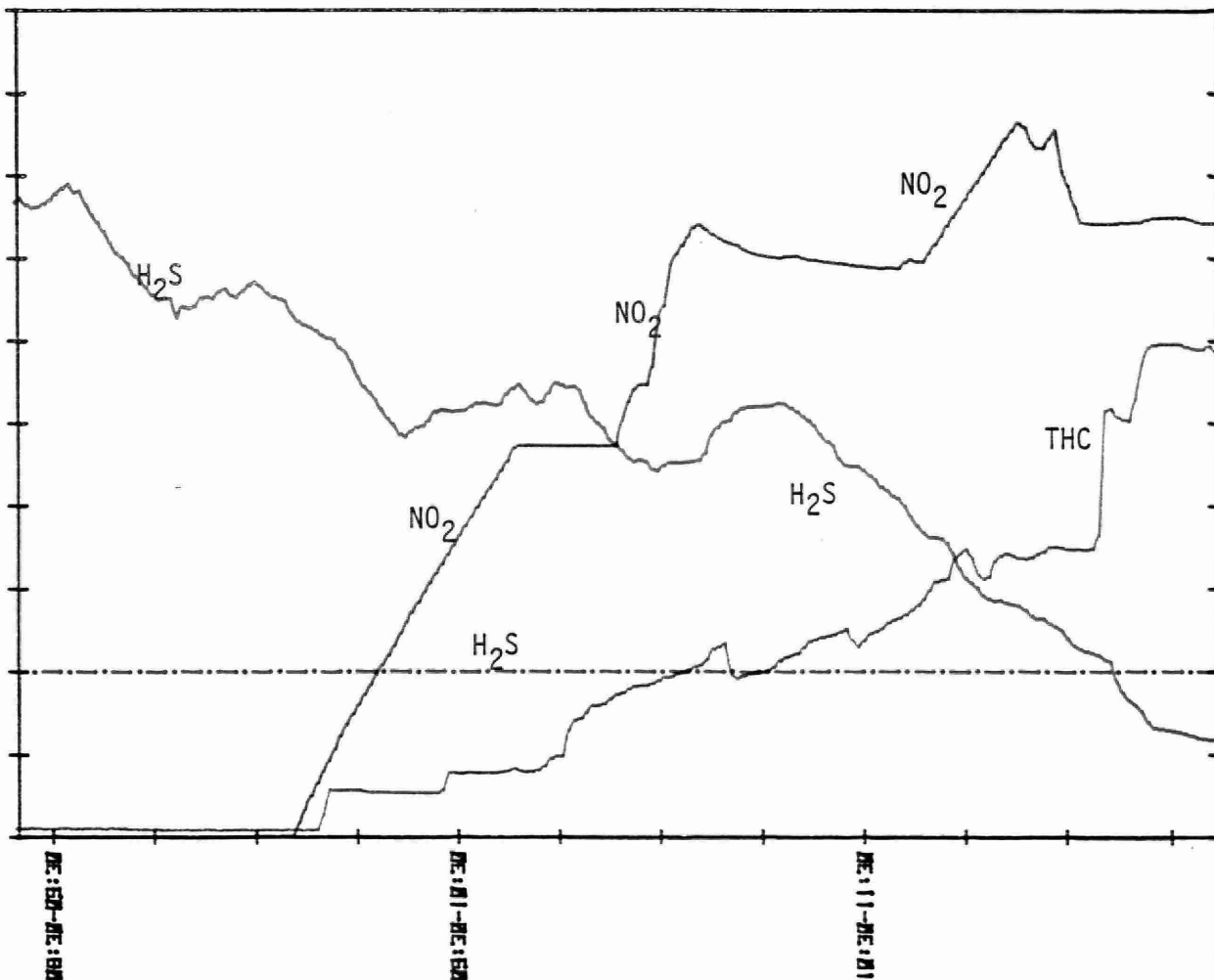
0.6

0.4

0.2

0.0

NO2



CRITERIA

H2S	NO2	THC
0.02	0.02	0.02
0.02	0.02	0.02

TIME

SARNIA #139

21:18 MAY 25 1977

SCAN= 300 SEC

AVE= 60 MIN

LAFALLE & VIDAL RDS.; (38118-475198)

2 X 10⁻² PPM
2 X 10⁻³ PPM
1 X 10⁻¹ PPM

6
4
2

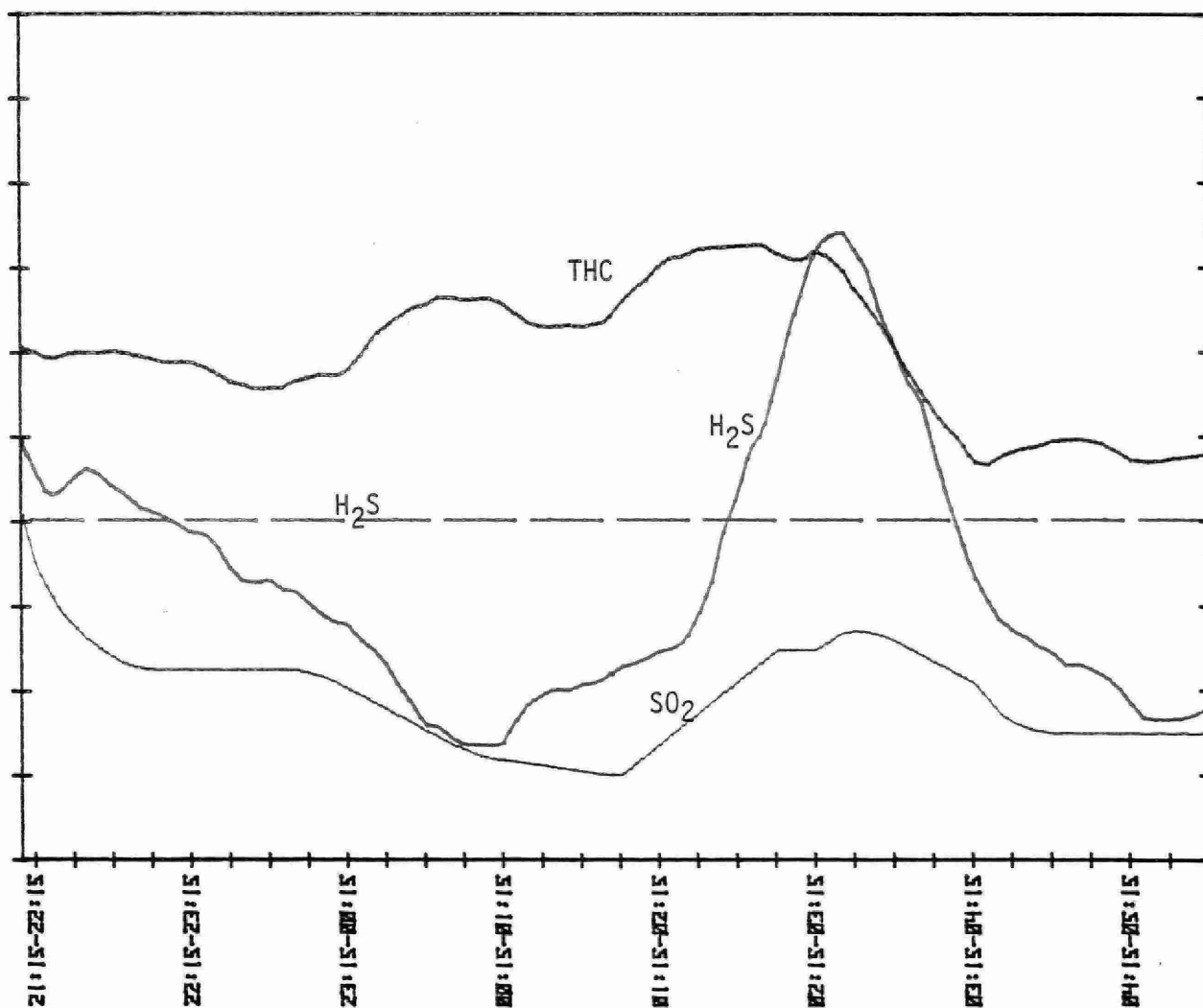
3.0
2.0
1.0

2.0
1.0
0

1.0
0.5
0

1
0.5
0

H2S
SO2
THC



CRITERIA

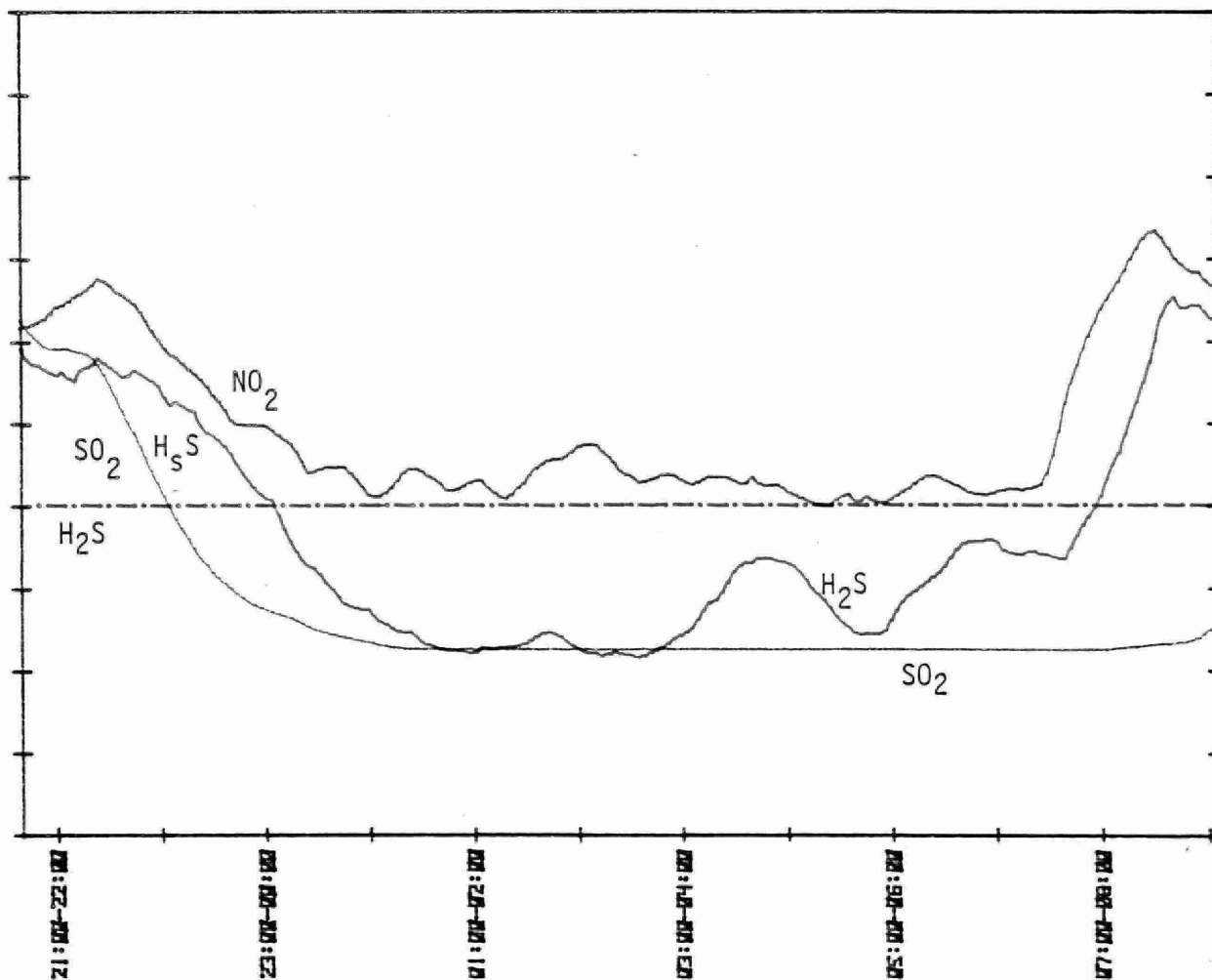
H2S 0.2 PPM

TIME

SARNIA #143

20:40 MAY 26 1977 SCAN= 300 SEC AVE= 60 MIN
 HWY #405 @ THE PARK N OF SHELL (30100-475050)

1.0 X 10⁻² PPM
 2.0 X 10⁻¹ PPM
 1.0 X 10⁻¹ PPM
 4.0 1.5 .6
 3.0 1.2 .6
 2.0 .8 .4
 1.0 .4 .2
 .5 .2 .1
 H₂S
 SO₂
 NO₂



CRITERIA

H ₂ S	0.302	PPM
SO ₂	0.25	PPM
NO ₂	0.20	PPM

TIME

SARNIA #145

16:45 MAY 30 1977

SCAN= 60

SEC

AVE= 60

MIN

HWY 408: IN FRONT OF LAMBTON GEN. STATION: (37950-473940)

5.0 X 10⁻² PPM
2.5 X 10⁻¹ PPM
2.5 X 10¹ PPM

CRITERIA

H2S 0.02 PPM

4.0 1.6 1.6

3.0 1.2 1.2

2.0 0.8 0.8

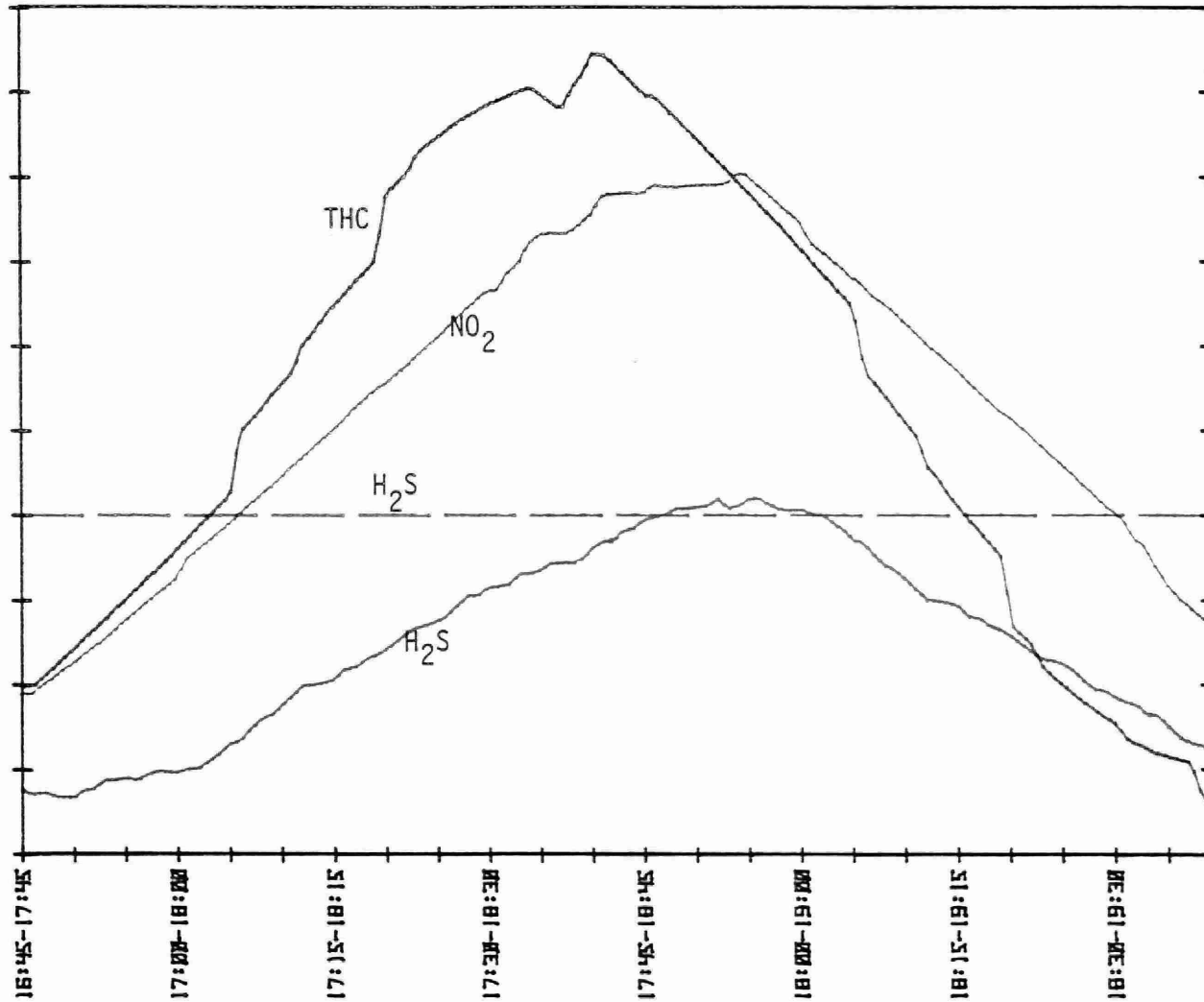
1.0 0.4 0.4

0.0 0.0 0.0

H2S

NO2

THC



TIME

SARNIA II #1

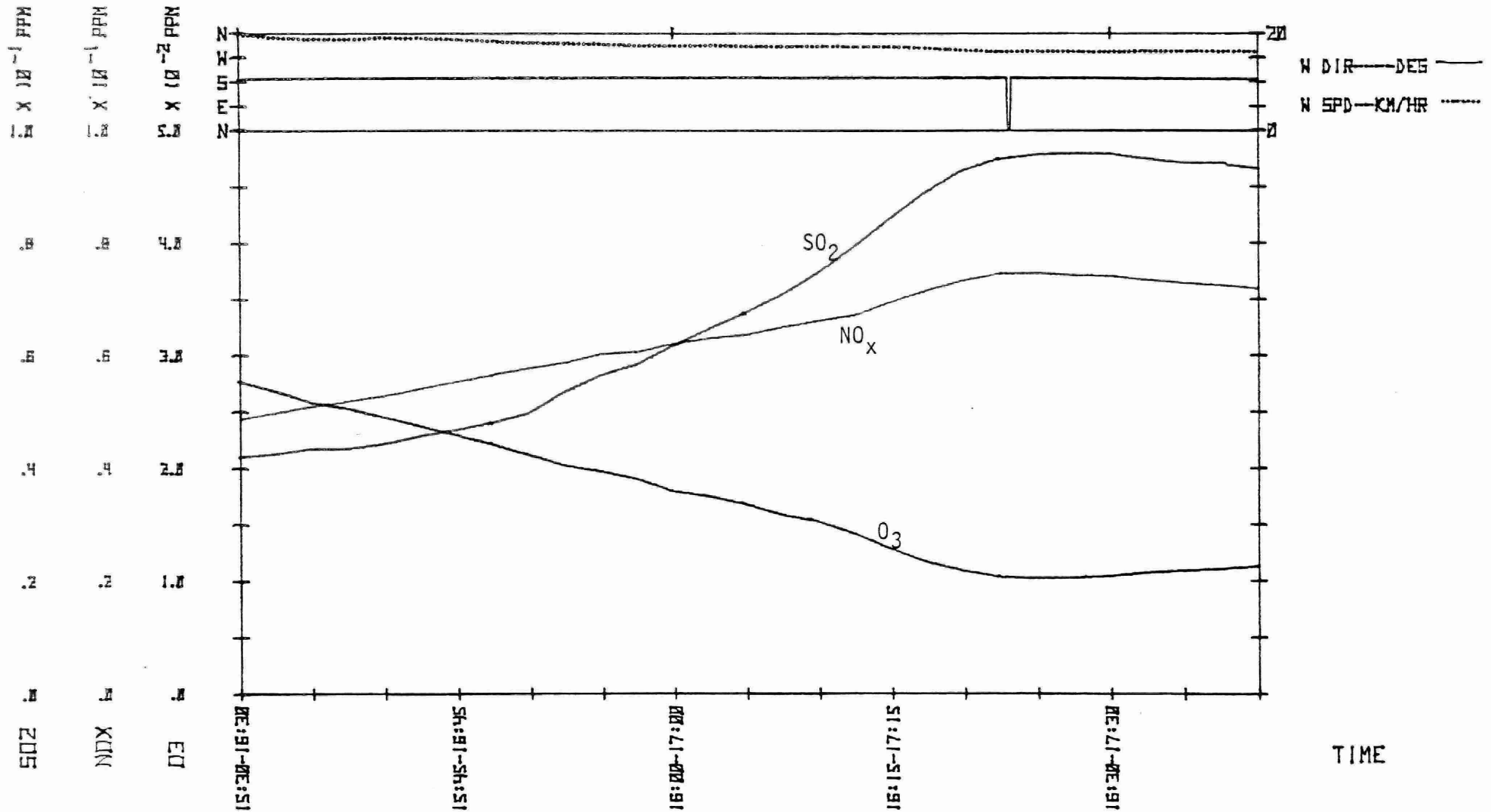
15:30 OCT 11 1978

SCAN= 150 SEC

AVE= 60 MIN

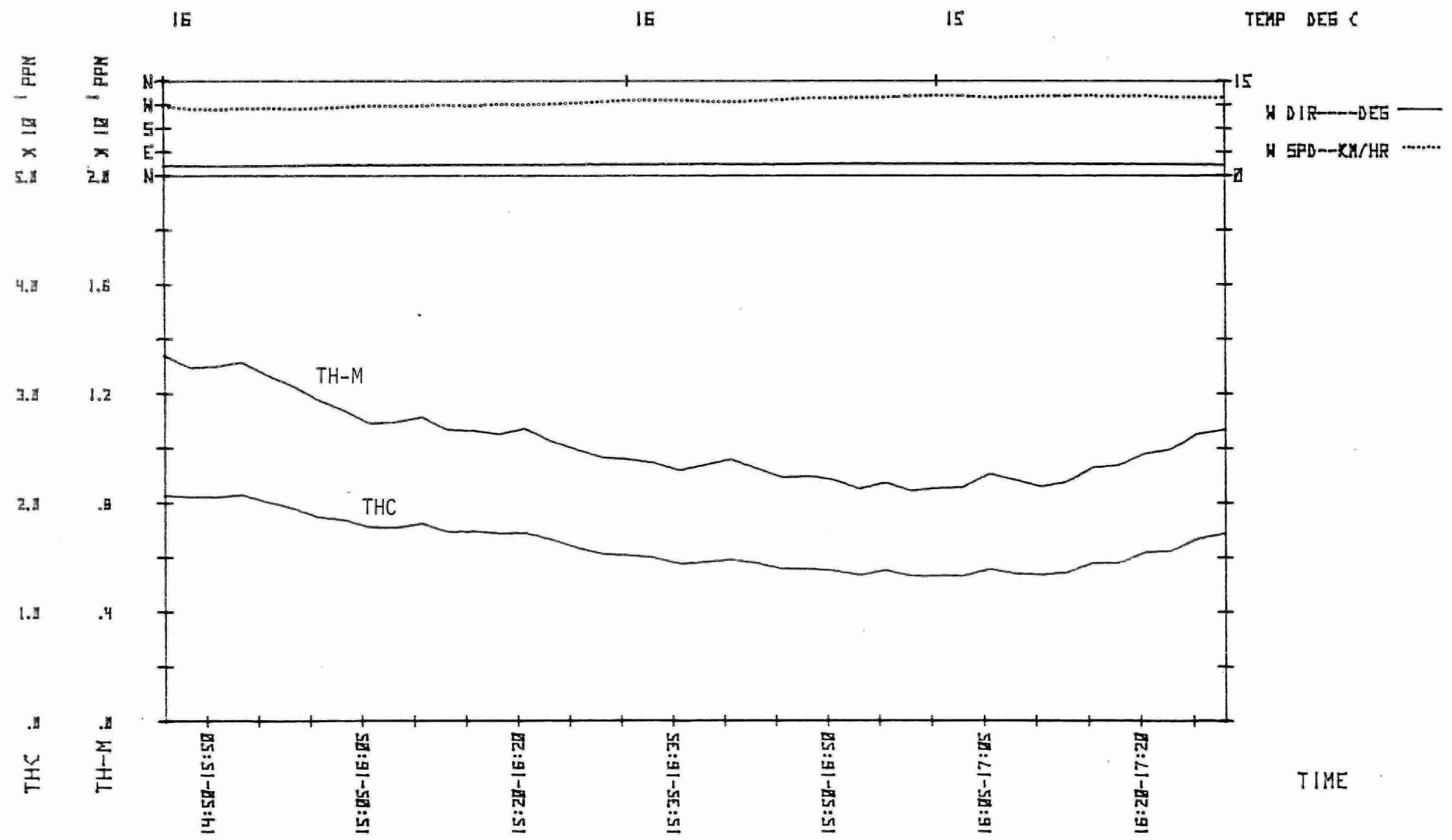
D.M.E. PT. EDWARD PLANT (13845-47618); S. 20KM & WIND 65/1MP

TEMP DEG C



SARNIA 11 #9

14:46 OCT 13 1978 SCAN= 150 SEC AVE= 60 MIN
 SUNDON DR. (03023-47537) 0.1KM @ 210065/SUN



SARNIA 11 #18

17:56 OCT 16 1978

SCAN= 150 SEC

AVE= 60

KIN

HURON BLVD. & TASHKOD AVE(03843-47545); 0.4KM & 2000SS/CAS

9

8

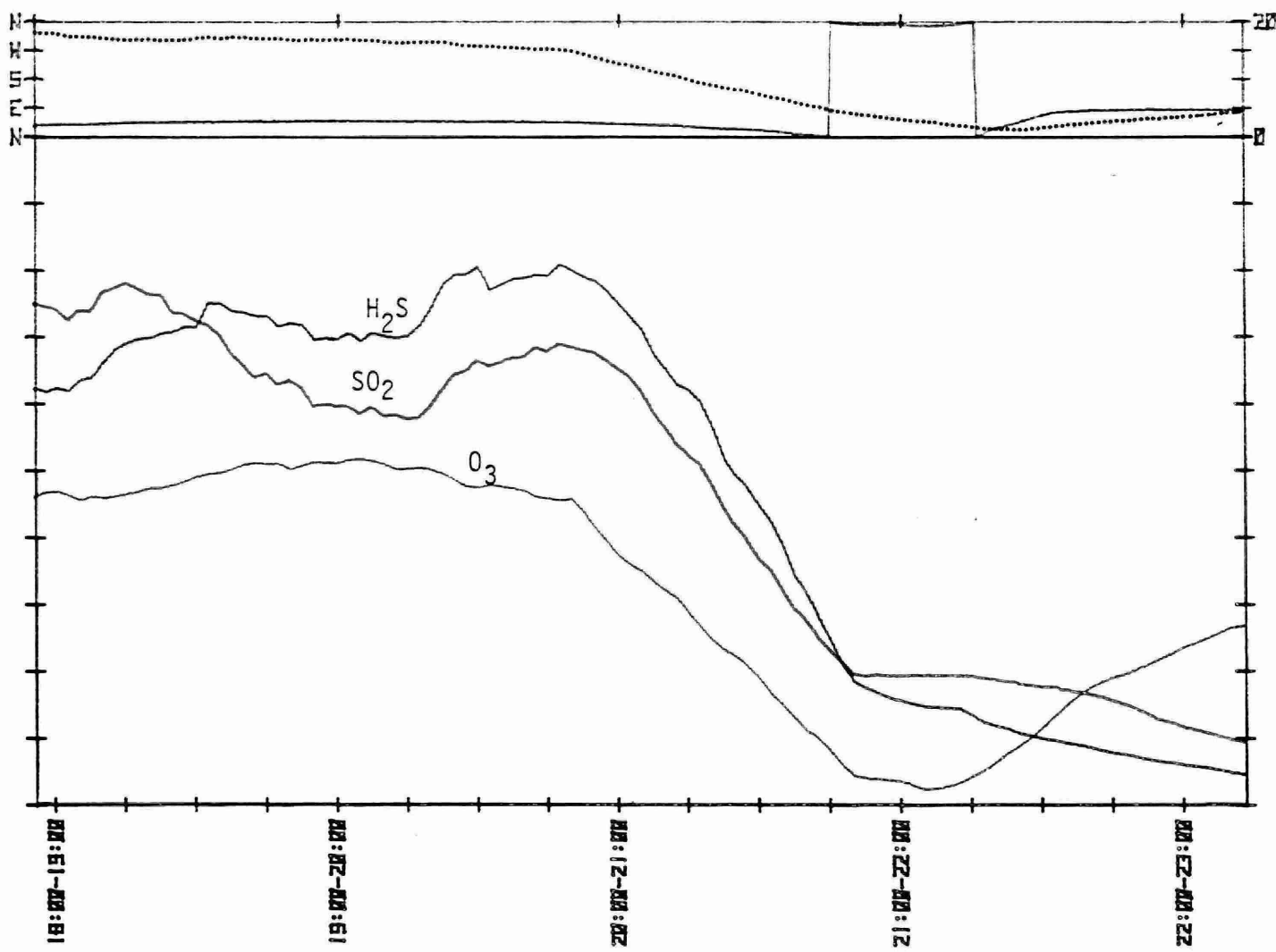
8

6

5

TEMP DEG C

5.0 X 10⁻² PPM
5.0 X 10⁻² PPM
5.0 X 10⁻² PPM
4.0
3.0
2.0
1.0
0
205
ED
52H



TIME

SARNIA 11 #19

12:24 OCT 17 1978

SCAN= 150 SEC

AVE= 60 MIN

Hwy #408, SUN-DON CURVE (03828-47541); 0.3KM & 040005/SUN

14

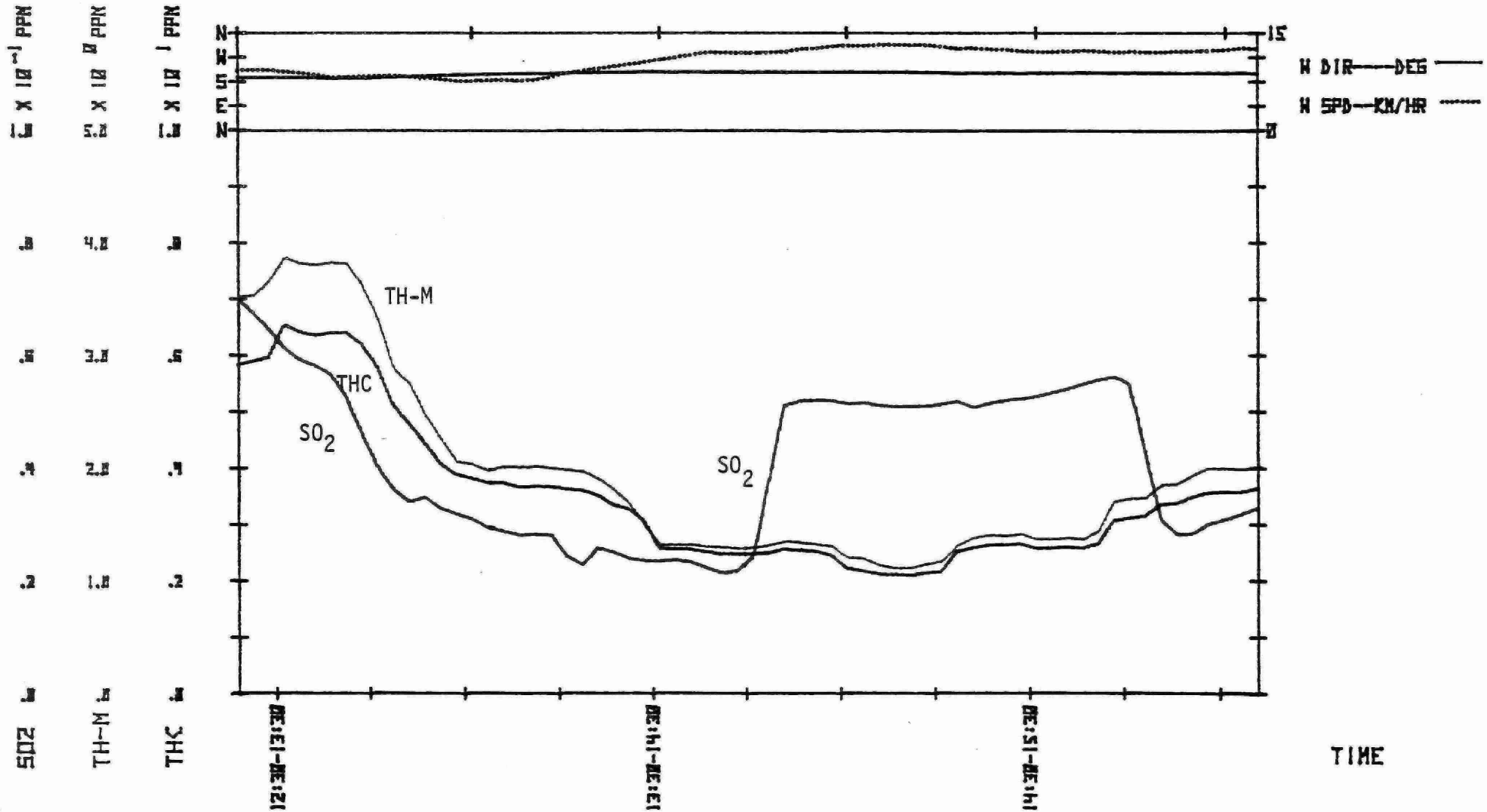
14

14

15

16

18 TEMP DEG C



SARNIA 11 #22

20:03 OCT 17 1978

SCAN= 90 SEC

AVE= 60 MIN

HURON BLVD. (03846-47549); 0.2KM @ 010065/STY

0.000
8
82
1005

0.000
7
88
1005

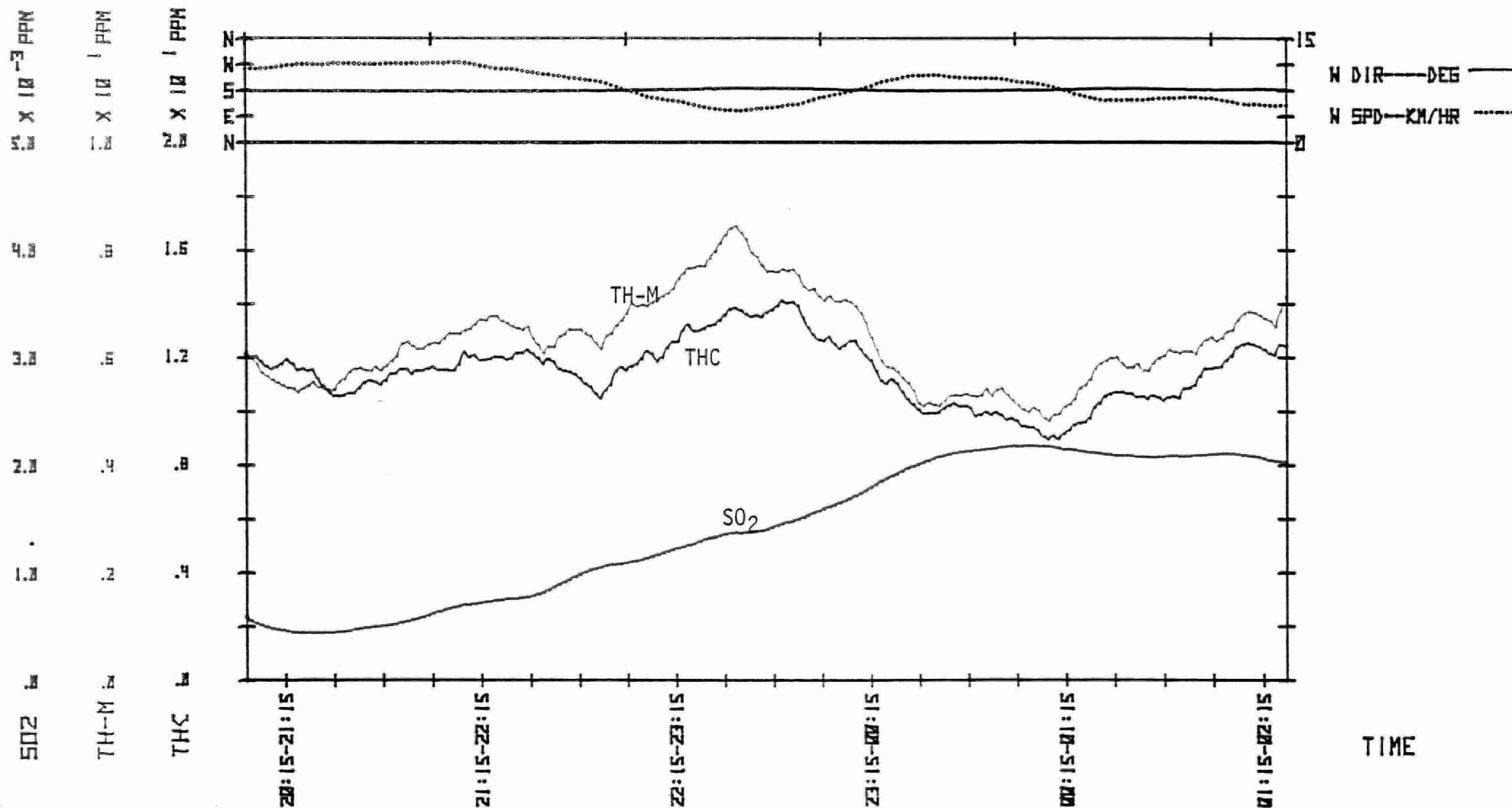
0.000
6
92
1004

0.000
6
91
1004

0.000
6
89
1004

0.000
7
84
1004

SRAD W/CH2
TEMP DEG C
HUM % REL
PRES MBAR



SARNIA 11 #25

19:16 OCT 19 1978

SCAN= 90

SEC

AVE= 60

MIN

VIDAL ST., SOUTH END(03834-47542); 1.00M & 130065/DONSTK

0.000
11
57
989

0.000
11
65
991

0.000
9
78
992

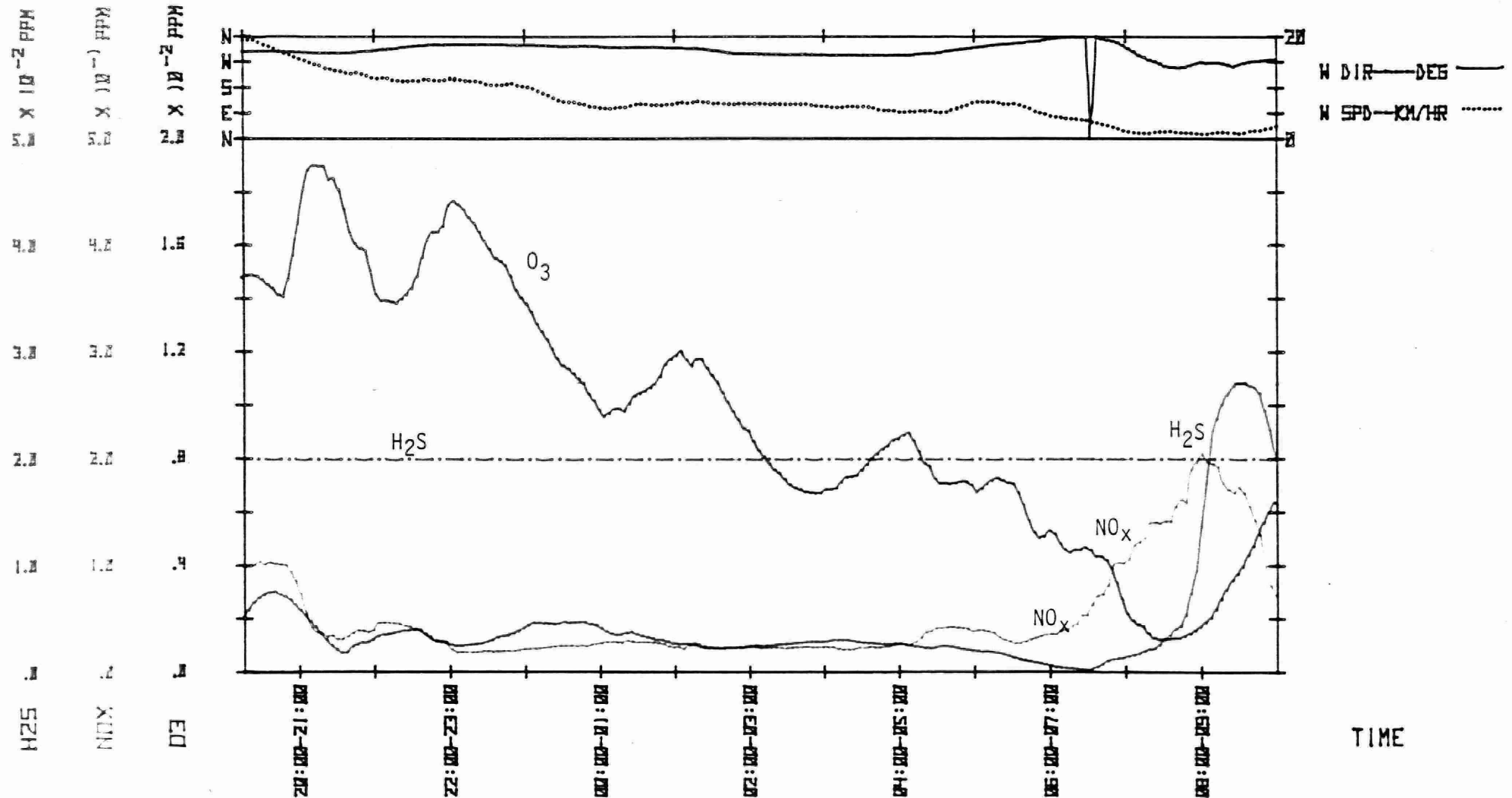
0.000
8
83
993

0.000
6
98
993

0.000
6
98
994

0.000
5
99
995

SRAD W/CM2
TEMP DEG C
HUM % REL
PRES MBAR



SARNIA 11 #35

16:20 OCT 24 1978

SCAN= 90 SEC

AVE= 50 MIN

HWY #408; SUN-DON CURVE (K3827-47542); 0.3KM & 040065/SUN

0.014
9
60
993

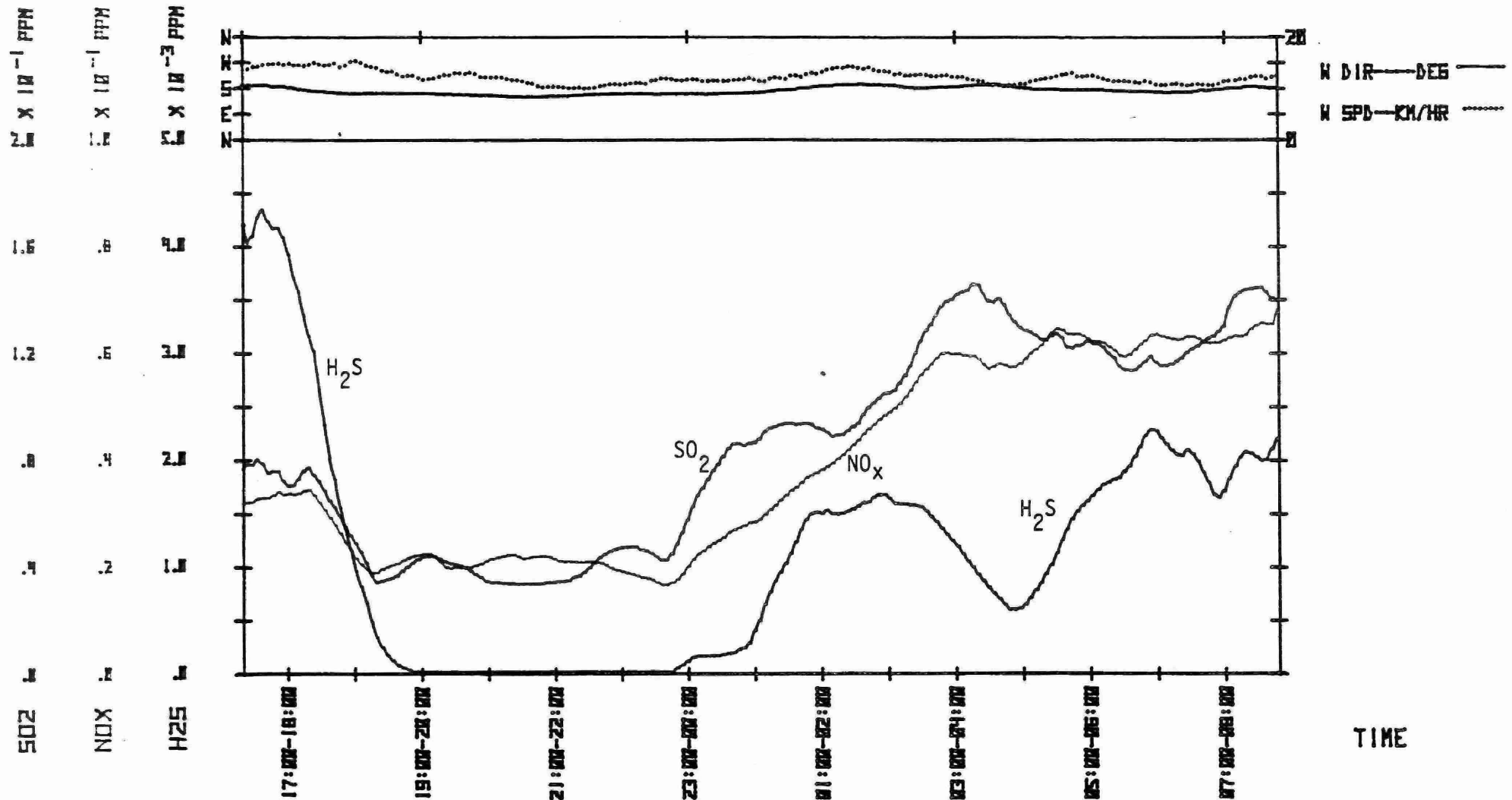
0.000
8
69
990

0.000
7
66
988

0.000
8
79
987

0.000
7
98
986

SRAD W/CM2
TEMP DEG C
HUM % REL
PRES MBAR



SARNIA 11 #36

19:16 OCT 25 1978

SCAN= 98 SEC

AVE= 60 MIN

HURON BLVD. (M3645-47549); 0.125CM & 0.0005/STY

0.000
13
100
981

0.000
14
100
982

0.000
14
100
982

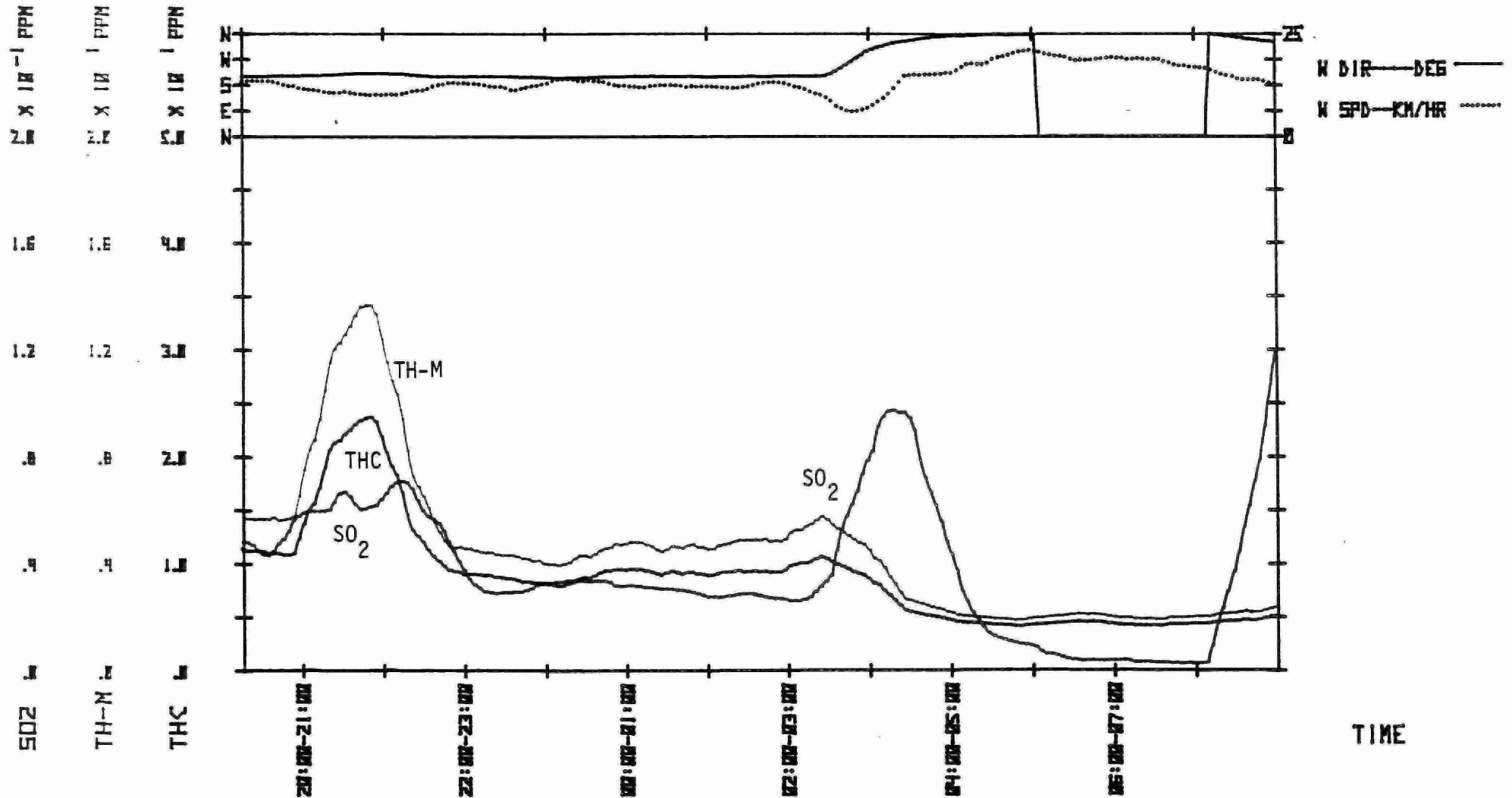
0.000
14
100
982

0.000
14
100
982

0.000
18
100
983

0.000
9
100
984

SRAD W/CM2
TEMP DEG C
HUM % REL
PRES MBAR



SARNIA 11 #36

19:16 OCT 25 1978

SCAN= 90 SEC

AVE= 60 MIN

MURON BLVD. (03845-47549); 0.125KM & 000005/STY

0.000
13
100
981

0.000
14
100
982

0.000
14
100
982

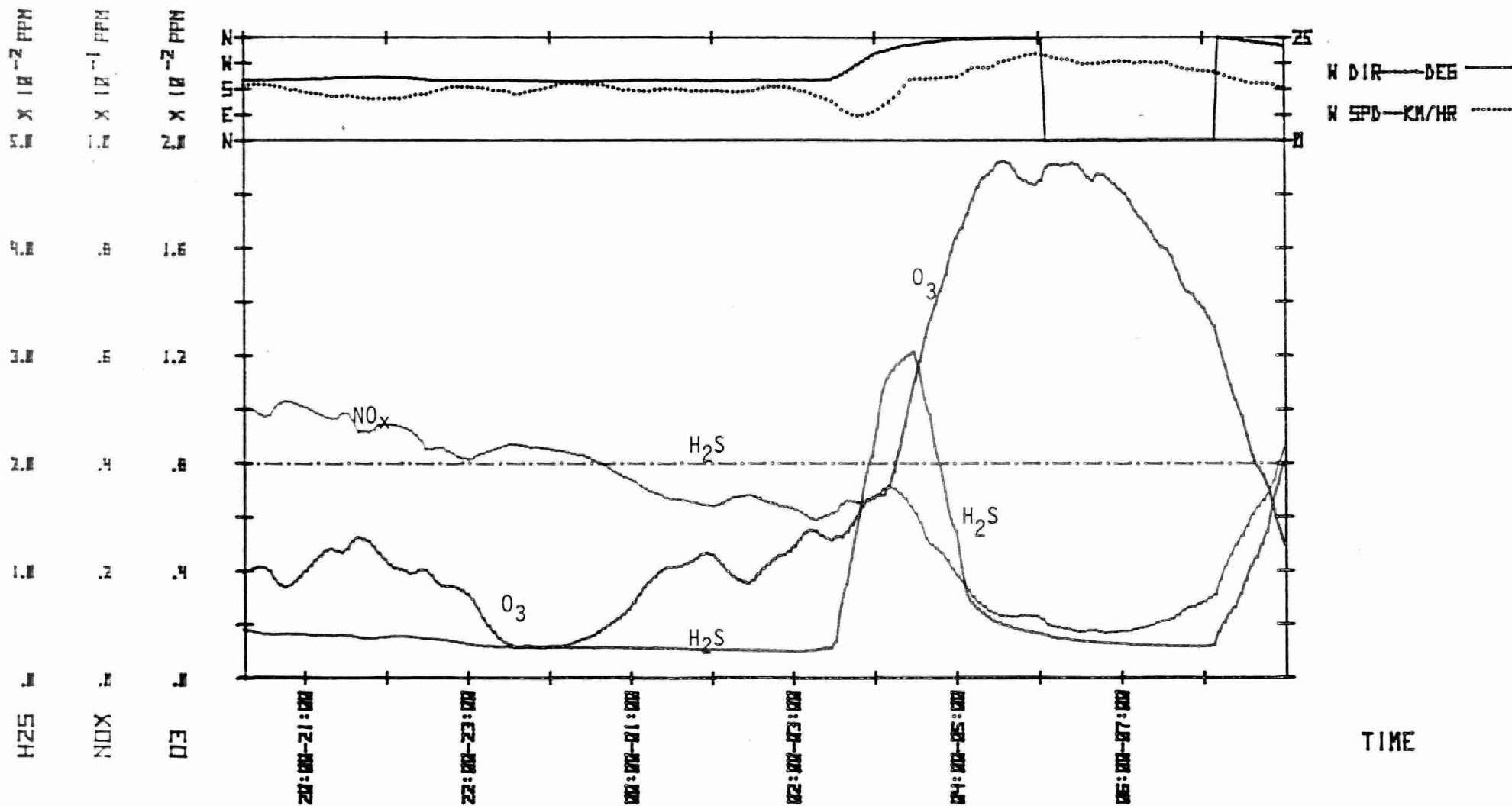
0.000
14
100
982

0.000
14
100
982

0.000
10
100
983

0.000
9
100
984

SAR0 W/CM2
TEMP DEG C
HUM % REL
PRES MBAR



SARNIA 11 #40

16:39 OCT 27 1978

SCAN= 120 SEC

AVE= 60 MIN

HURON BLVD. (03848-47549); 0.3KM & 170065/CABSTK

0.014
17
32
990

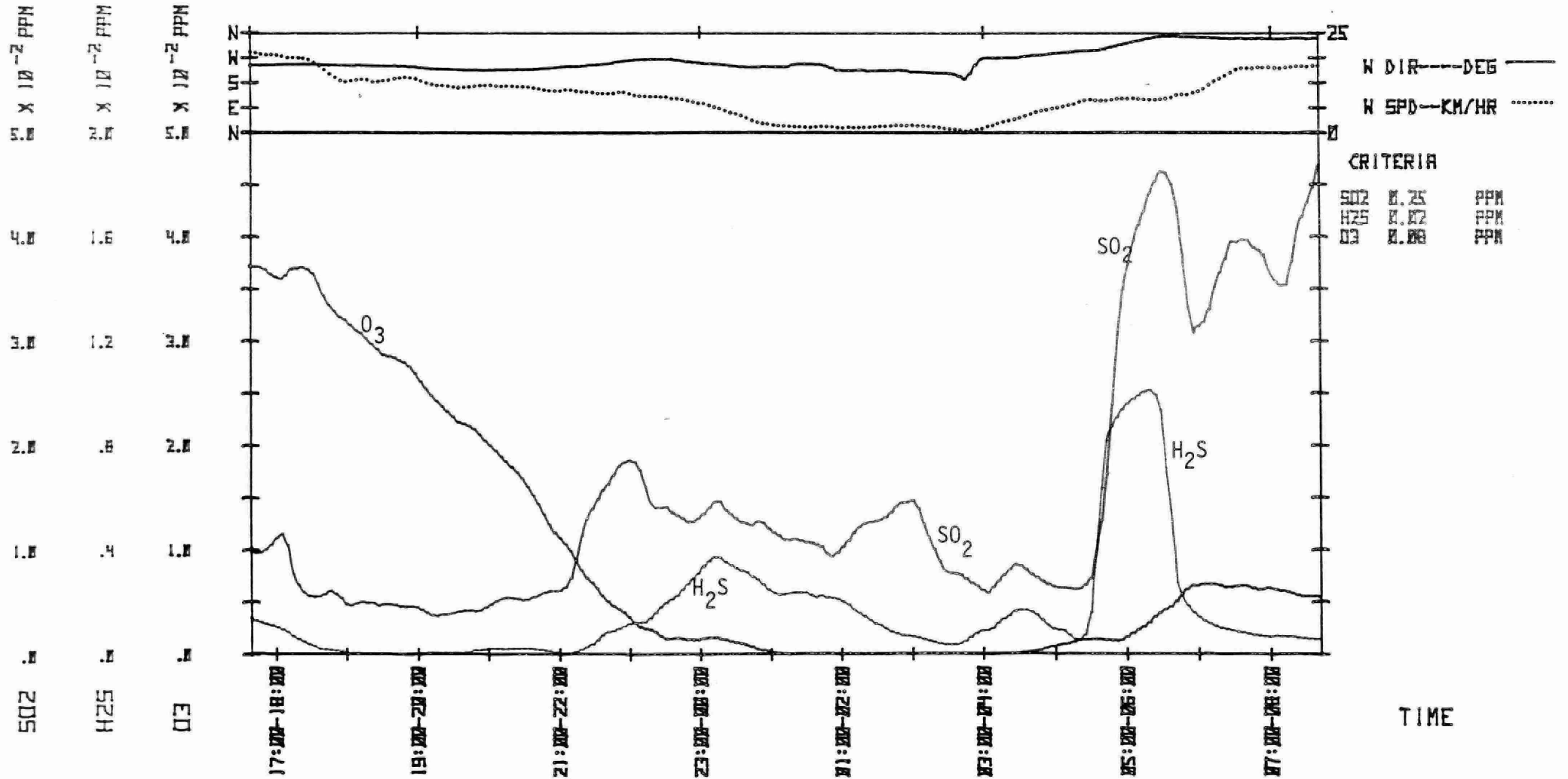
0.000
13
50
992

0.000
11
61
994

0.000
4
53
564

0.000
7
93
998

SRAD W/CN2
TEMP DEG C
HUM % REL
PRES MBAR



SARNIA 11 #47

11:18 NOV 1 1978

SCAN= 150 SEC

AVE= 60 MIN

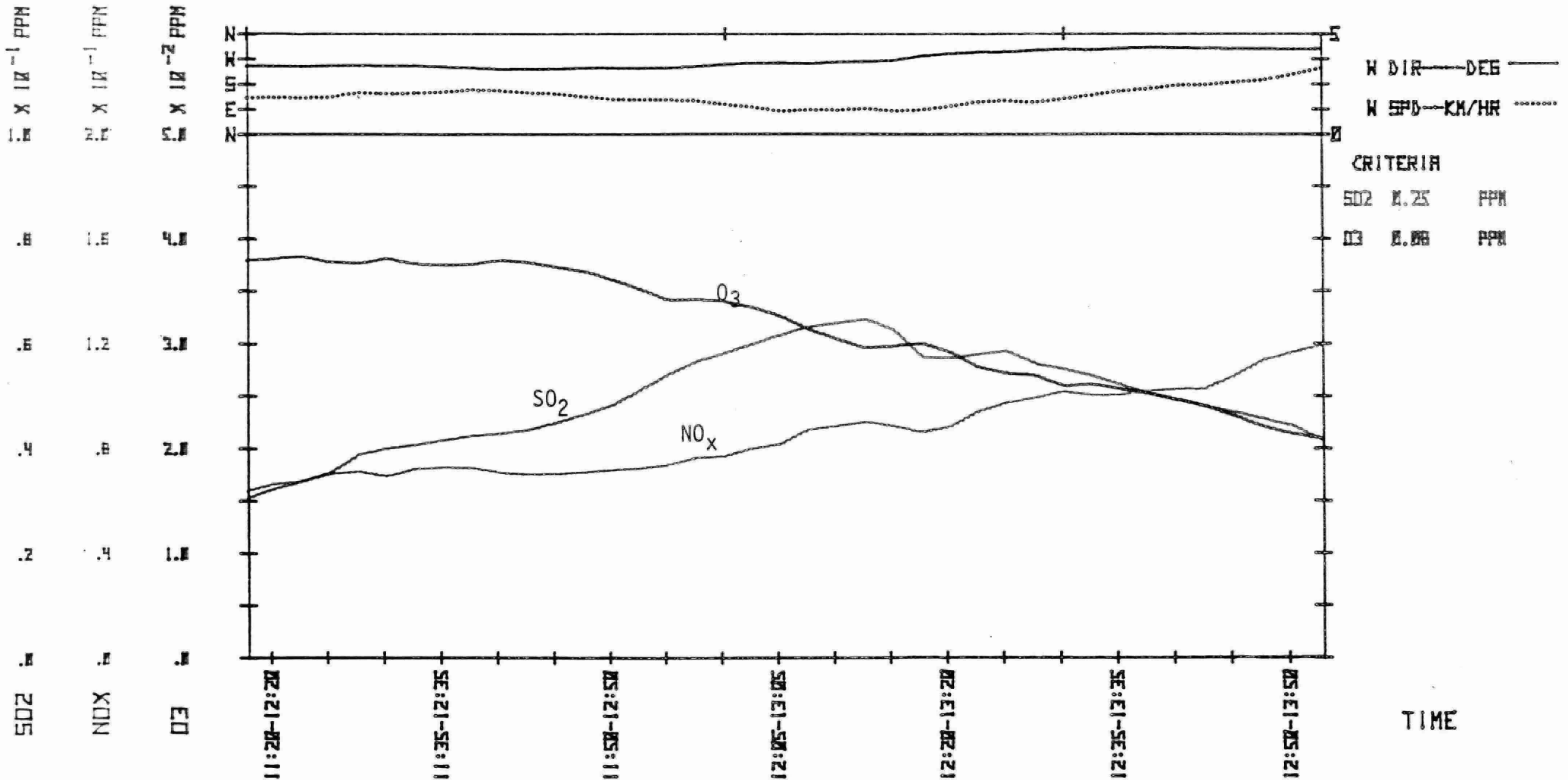
VIDAL ST. & HURON BLVD. (03840-47550); BACKGROUND

0.061
14
36
1006

0.059
14
33
1006

0.056
16
29
1005

SRAD W/CN2
TEMP DEG C
HUM % REL
PRES MBAR



SARNIA 11 #47

11:18 NOV 1 1978

SCAN= 150 SEC

AVE= 60 MIN

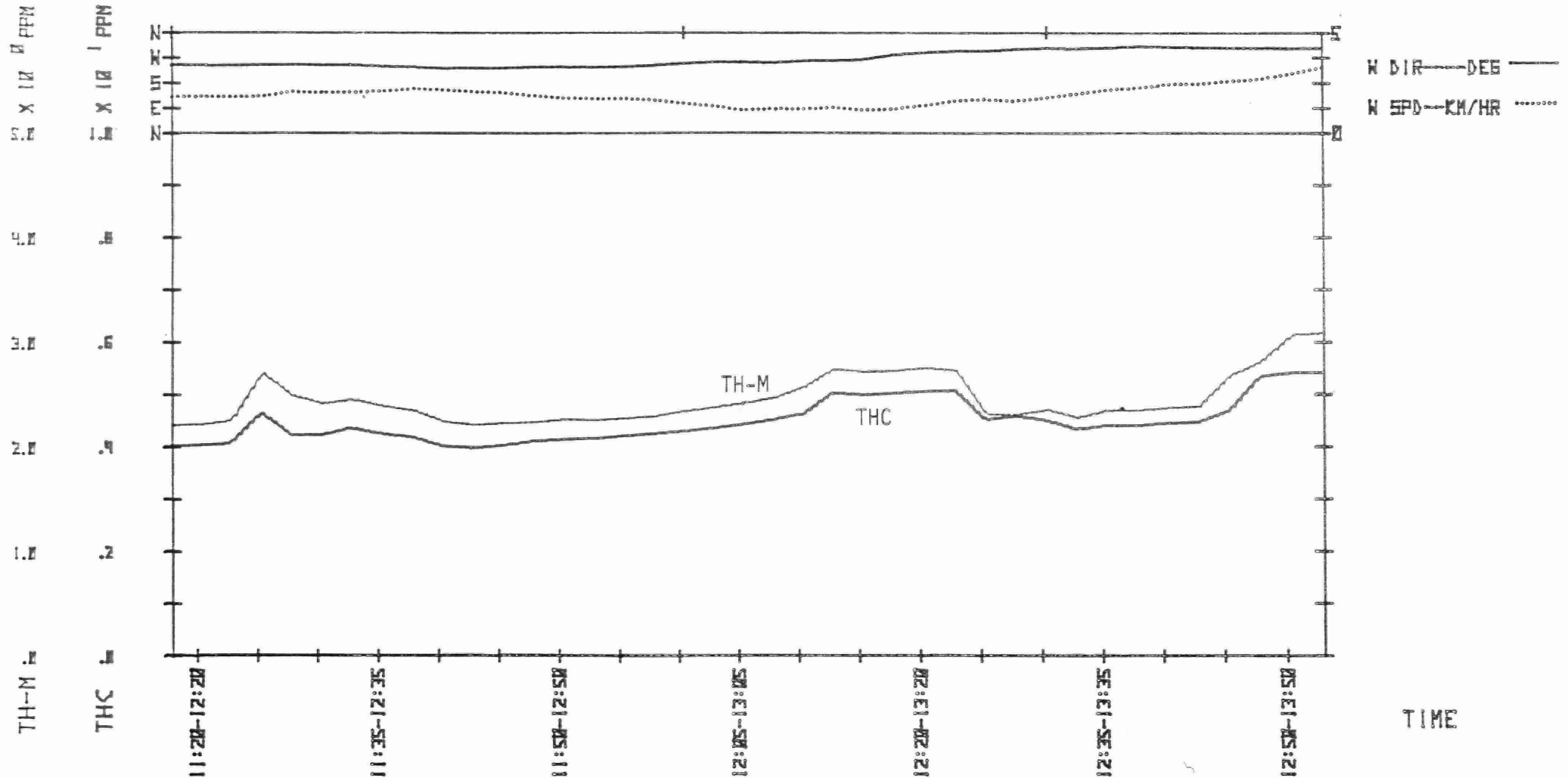
VIDAL ST. & HURON BLVD. (03040-47550); BACKGROUND

0.051
14
36
1006

0.059
14
33
1006

0.056
16
29
1005

SRAD W/CMZ
TEMP DEG C
HUM % REL
PRES MBAR





96936000009415